INSIDE: SEND IN THE COWS

Montana Outdoors

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NOVEMBER–DECEMBER 2017

FLYING HIGH

The bald eagle's remarkable recovery

IN THIS ISSUE:

WHERE LION TRACKS LED

HOW WILDLIFE SURVIVE WINTER

SAFELY CROSSING U.S. HIGHWAY 93

YES, GRIZZLIES AND PEOPLE CAN COEXIST

Montana Fish, Wildlife & Parks

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Montana Outdoors

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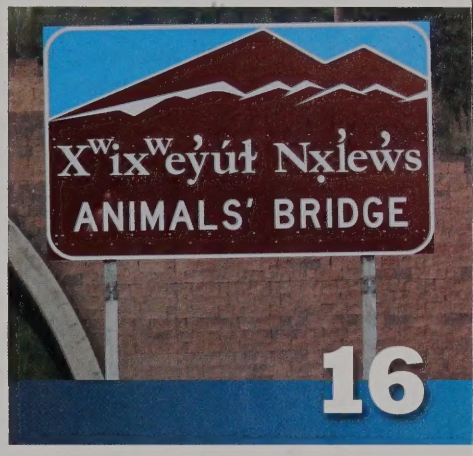

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COULD BE WORSE It might appear that deer and other wildlife suffer in winter, but most get along just fine. Read how they do it on page 22. Photo by Donald M. Jones

FRONT COVER A bald eagle returns to its nest in the Bitterroot Valley. See page 10 to read about the raptors' amazing comeback. Photo by Kate Davis.

What about wolves and CWD?

As noted in your recent article "Disease at the Door" (September-October), chronic wasting disease is marching inexorably across North America. As we plan for its arrival, we should consider that wolves can help Montana avert wildlife disease outbreaks. Wolves are essential to the health of the ecosystems on which our game animals and we depend. Wolves have been shown capable of reducing or eliminating the spread of brucellosis and chronic wasting disease, according to Tom Hobbs, a senior scientist at Colorado State University, in part by reducing density and sizes of elk and deer groups. In one paper, he and the other authors concluded, "We suggest that as CWD distribution and wolf range overlap in the future, wolf predation may suppress disease emergence or limit prevalence." In a study on the role of predation and wild ungulate disease, Margaret Wild, a research scientist with the National Park Service, observed that during one hunting season, Wisconsin had extended hunting opportunity to 108 days in an attempt to reduce CWD-infected white-tailed deer, and then hired sharpshooters at a cost of $27 million. Hunters can't contain CWD. But wolves can: They are on the hunt 365 days of the year, 24 hours a day, with 100 times our sensory capacity, selectively sifting and sorting for disabled or disadvantaged prey less likely to kick their teeth out.

Norman A. Bishop
Bozeman

Ken McDonald, chief of the FWP Wildlife Division, replies: Mr. Bishop is correct that, in some situations, wolves could reduce numbers of deer carrying CWD. However, wolves can't be directed to specific areas where CWD might be discovered, as hunters could. And for wolves to have any population-wide effect on deer infected with CWD or other diseases, the number of those large carnivores needed would far exceed what Montanans would tolerate. Additionally, because of the way deer associate with each other, even at low densities we would likely continue to see CWD spread.

DISEASE AT THE DOOR
MONTANA WILL RELY ON HUNTERS AND LANDOWNERS TO HELP CONTROL CWD WHEN (NOT IF) IT ARRIVES.
BY LAURA LINDQUIST
SPECIAL REPORT
One day soon, Montana Fish, Wildlife & Parks veterinarian Jennifer Ramsey will receive the email she's long dreaded: Colorado State University technicians will have found chronic wasting disease in one or more of the deer tissue samples she sent them. That message will change the future, both for FWP and the state's deer and elk hunters.

Revved up

Bravo on the September-October issue. From the mailbox to the chair, I couldn't put it down. So much was packed into this issue: great articles, stories, useful information, pictures, and tips. After this issue, I'm looking forward to the coming seasons and spending my days here in the Rocky Mountains, hunting and exploring our vast wonderland. Keep up the great work at *Montana Outdoors*.

Paul Thornton
Superior

Missed opportunity

Thanks for producing such an amazing magazine. In reading your article "Moving Meat" (September-October), you missed an opportunity to warn hunters of the dangers that pack goats pose of spreading pneumonia to bighorn sheep and mountain goats. It is highly recommended not to use pack goats in occupied wild sheep or mountain goat habitat. Many people are aware of the disease risk from domestic sheep, but few know that domestic goats that come into contact with wild sheep or mountain goats could create the same problem. It's important that all pack goats be tested and certified free of any bacterial pneumonia diseases.

Matthew Jeffress
Elko, NV

Ride 'em, deer hunter!

In your article "Moving Meat" (September-October), you forgot to mention the option of *riding* your harvested deer back to the vehicle. My friend, a teacher at Sentinel High School here in Missoula, makes it a rule to always hunt uphill from where he parks his vehicle. One year he took his mountain bike with him. After he shot and field dressed his deer, he covered the bike seat with a plastic bag then tied the carcass on the bike, with the body cavity over the seat and front legs out over the handlebars. Then he climbed atop the deer and rode it downhill to his vehicle, like riding a horse. I wish I could have seen the reaction of hunters who saw him arrive at the parking area that day.

Larry Roland
Missoula

Prairie bird puzzle

I enjoyed Catherine Wightman's article on grassland birds ("Cow or Plow?" March-April 2016). In late August, while enjoying your beautiful prairie land in southeastern Montana, I sat down for a while on a concrete bridge abutment. A minute or two later, a small brown bird with a stripe through its eye landed nearby, seemingly curious. It hopped closer and closer, until it was just two feet away. As it flew off, I noticed a light banding across its tail. I'm wondering if that was the Sprague's pipit described in Ms. Wightman's article.

Paul Coté
Lapeer, MI

Catherine Wightman, FWP Wildlife Habitat and Farm Bill Programs coordinator, replies: I'm pleased to hear you were out enjoying Montana's beautiful prairies and had your eye out for grassland birds. I suspect what you saw was a spotted sandpiper. They are curious birds found typically at the water's edge (I am assuming there was a prairie stream or river nearby, since you were on a bridge). Your physical descriptions match those of a spotted sandpiper during the nonbreeding season, which matches the date you saw that bird. They show their spots only during the breeding season, earlier in the year. The behavior and field marks you describe do not match those of a Sprague's pipit, which tends to be secretive. Still, it's nice knowing you were out looking for these birds.

Speak your mind

We welcome all your comments, questions, and letters to the editor. We edit letters to meet our needs for accuracy, style, and length. Write to us at Montana Outdoors, *P.O. Box 200701, Helena, MT 59620-0701. Or e-mail us at: tdickson@mt.gov.*

Red Rooster Braised Venison

By Tom Dickson | Preparation time: 30 minutes | Cooking time: 3 hours | Serves 4

GREG RANNELLS

This dish, perfect for a holiday dinner with guests, is based on Marcus Samuelsson's braised short ribs served at his Red Rooster Harlem restaurant in New York City.

A best-selling cookbook author and award-winning chef, Samuelsson was born in Ethiopia but raised in Sweden, where his adopted grandmother taught him to cook. While growing up in rural Scandinavia, he learned how to prepare waterfowl, rabbit, and other game. World's Best Venison Stew, our version of his yummy moose stew recipe, appeared here in the March-April 2013 issue.

Red Rooster Braised Venison is yet another reason I treasure shanks, the neck, and tough shoulder meat as much as any other cuts on an elk or deer. People think I'm nuts—until they come over for dinner.

You can find lemongrass (produce section) and plum sauce (Asian foods aisle) at natural food stores or the larger grocery chains. Tips on how to prepare lemongrass, a staple of many Asian recipes, are available online. If you can't find any, lemon zest is a decent substitute.

—Tom Dickson is editor of Montana Outdoors.

INGREDIENTS

2 lbs. deer or elk shanks, neck meat, or tough shoulder meat (or, if you lack venison, six 6-ounce beef short ribs)

Salt and pepper

2 T. vegetable oil

1 small onion, chopped

1 carrot, trimmed and chopped

1 celery rib, trimmed and chopped

1 lemongrass stalk, trimmed, smashed, and minced (or zest from ½ lemon)

2 garlic cloves, chopped

1 (1-inch) piece ginger, peeled and minced

½ c. dry red wine

2 c. beef or chicken broth

½ c. plum sauce

¼ c. soy sauce

½ t. dried thyme flakes

1 t. chopped flat-leaf parsley

1 bay leaf

DIRECTIONS

Heat oven to 300 degrees. Pat meat dry with paper towels and season with salt and pepper.

Heat oil in a large Dutch oven over medium-high heat. When oil shimmers, add meat and brown on all sides, about 4 minutes per side; transfer to a plate.

Add onion, carrot, celery, lemongrass, garlic, and ginger to the pot. Season with salt and pepper and cook, stirring often, for 5 minutes. Add wine, broth, plum sauce, soy sauce, thyme, parsley, and bay leaf and bring to a simmer.

Return meat to pot, along with any juices. Cover and slide pot into oven. Braise until meat is fork-tender, about 3 hours.

Pull meat off bone and transfer to a plate (or leave meat on if desired). Strain braising liquid through a fine mesh sieve. Discard bay leaves and transfer vegetables to a food processor. Whiz up the mixture until smooth, then add 1½ cups of the braising liquid and whiz to combine.

Return sauce to Dutch oven and season to taste with salt and pepper. Add meat and reheat.

Spoon meat and sauce over mashed potatoes, or serve with crusty bread to soak up the scrumptious sauce. ■

EMILY HILLIARD

HAPPY HOLIDAYS!

Several readers have asked about a chocolate cake I've mentioned a few times in this column. It's hands down the best cake I've ever eaten, and I thought I'd share it this holiday season. Find the recipe by Googling "NYT whiskey chocolate bundt cake." For the whiskey, try the Pendleton 1910 Canadian rye.

Protecting grizzlies while keeping people safe

This past summer I met with area ranchers and others in Augusta, a town of 315 people between the Rocky Mountain Front and Great Falls, to discuss grizzly bears expanding their range beyond the Northern Continental Divide Ecosystem (NCDE).

Across Montana, people are talking about grizzlies. Earlier this year, the U.S. Fish & Wildlife Service removed the Greater Yellowstone Ecosystem (GYE) population from the Endangered Species List. This reverted management of those bears back to Montana, Wyoming, and Idaho. In its decision, the federal agency noted that the GYE population has grown from as few as 136 grizzlies in 1975, when it was listed, to an estimated minimum of 717 today—far above the federal recovery goal of 500.

Some people worry that GYE grizzlies won't do as well in state hands as under federal protection. Let me lay those concerns to rest.

Removing the GYE population from federal oversight doesn't remove protections for grizzlies. Grizzly bears are still classified as a protected game animal, protected from illegal or indiscriminate killing. As part of delisting conditions, Montana, Idaho, Wyoming, and federal land-management agencies all signed a GYE Grizzly Bear Conservation Strategy that ensures a healthy recovered population. The strategy strictly constrains mining, logging, and energy development in a six-million-acre area of the ecosystem containing the highest grizzly densities.

Grizzlies are spreading east from the Rocky Mountain Front, causing some people new to living near bears to raise public safety concerns.

As for grizzly bear hunting, it's true that under state management, Montana could create a restricted season. But FWP has no plans to propose hunting any time soon.

The people I met in Augusta are concerned about grizzlies, but from a completely different perspective. They worry about NCDE bears showing up in towns, ranches, and even backyards. Grizzlies expanding east and south from the Front are now spotted in places where they haven't been seen in a century or more.

That represents success for grizzly population restoration. But from the perspective of a ranching family, seeing a bear out by the swing set isn't cause for celebration. Not that they are anti-grizzly. The people I met in Augusta told me they were glad grizzlies are doing well. But they and others unaccustomed to having bears living where they live worry about their family's safety and livestock. One woman told me she no longer lets her children walk to the local river to fish, as they had for years, because "it's where the grizzlies sleep."

FWP cares about people and we care about grizzlies. Our mission is to be stewards of Montana's wildlife. But we know that wildlife can affect livelihoods and even threaten public safety. We also know that building tolerance for grizzlies among those who have to live with bears is critical in conserving those populations.

If you're concerned about the future of grizzlies in Montana, rest assured that the Great Bear is in good hands. FWP has a strong track record of managing wildlife, including large carnivores. We maintain healthy and sustainable populations of wolves, mountain lions, and black bears. There's every reason to believe that the grizzly—the very symbol of Montana Fish, Wildlife & Parks—will be just as well conserved. We're not about to let grizzlies disappear from a state where it remains widely revered, or to even let the population drop anywhere near to where it would again need federal protection.

For those who are concerned about grizzlies living near where you live, I promise this agency will do all it can to ensure your family's safety and help find ways for you and bears to coexist.

For years, we've seen proof in the Seeley-Swan, Flathead Basin, Blackfoot Valley, Whitefish area, and elsewhere in Montana that bears and people can live in the same general areas. It's not easy. Safeguarding families and livestock while ensuring that bears aren't unduly killed requires cooperation, communication, and patience. But the honor of living in one of the few remaining states with healthy grizzly populations makes that effort more than worthwhile.

—**Martha Williams**, Director, Montana Fish, Wildlife & Parks

CHRIS MCGOWAN

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JOHN WARNER

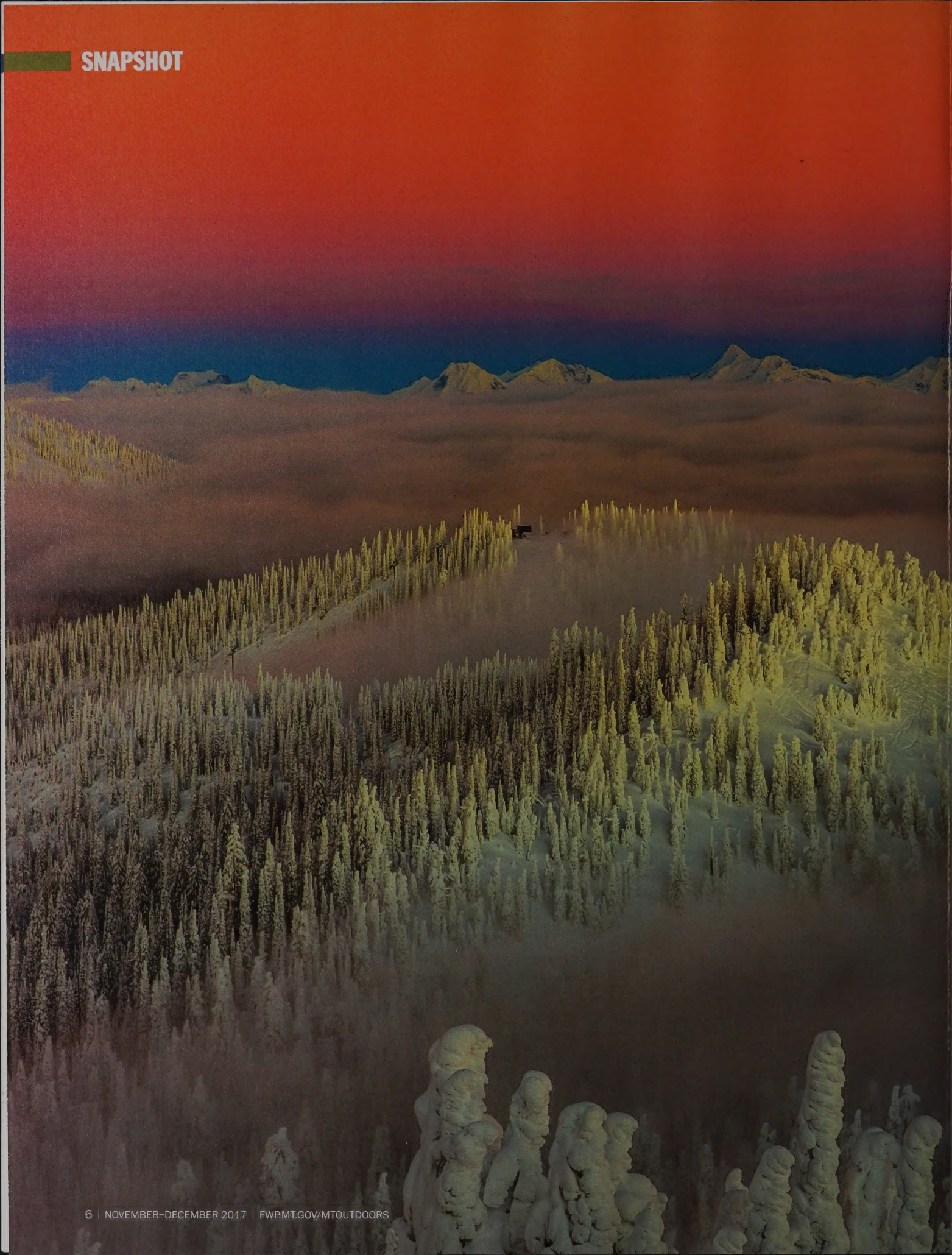
STATE PARK PROUD

CHRIS DANTIC Makoshika State Park Manager, Glendive

I'm standing in the park visitor center in front of our famous triceratops skull, one of many amazing dinosaur fossils on display at Makoshika. It's hard to know where to begin when describing all the cool things about this park, the crown jewel recreation site in eastern Montana. In addition to our popular, museum-quality visitor center, we offer archery and rifle ranges, an outdoor pavilion and ampitheater, a nationally recognized disk golf course, 11 designated hiking trails, and both RV and backcountry campsites.

Right now we're also working on developing mountain biking trails and equestrian trails and soon hope to offer horse rentals so people can tour the park on horseback. And that's not even mentioning the park's awesome scenery and the incredible feeling of tranquility you get from spending time here.

It's such an honor for me to be a part of a park that offers so much to visitors and the local community. One of the most rewarding parts of my job is when people from Glendive, Sidney, Miles City, and the surrounding areas bring their guests from out of town to Makoshika. I get to see the pride they have in sharing with their friends and family members this world-class state park that's right in their own backyard.



After a long day of skiing at Big Mountain Ski Resort in Whitefish, photographer **Chuck Haney** took the last chairlift to the summit and spent the next hour photographing Flower Point rising up from a fog inversion, with the peaks of Glacier National Park in the distance. "That was at about 5 p.m. on New Year's Eve. Everything just came together with that fantastic light bouncing off the top of the clouds, the snow ghosts covering the mountain, and then that warm pink light contrasting with the blue on the horizon," Chaney says. "It was a surreal scene."

1876

The year the use of explosives for harvesting fish was outlawed in Montana Territory.

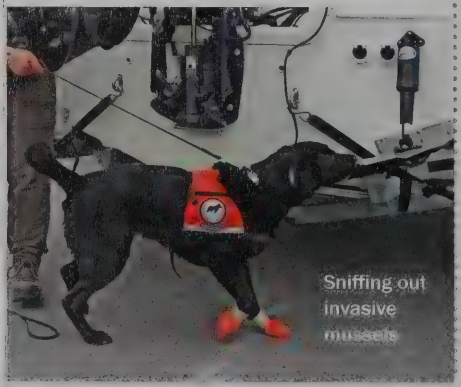
No new mussels

When scientists detected zebra mussels at two Montana reservoirs in late 2016, Governor Steve Bullock and the Montana Legislature called on FWP to pull out all the stops to keep the invasive mussels from spreading elsewhere.

The agency did. Highlights from the FWP Aquatic Invasive Species Bureau's 2017 season:

- 71,000 watercraft inspected;
- 16 out-of-state vessels containing mussels intercepted and decontaminated before they could enter Montana waters;
- 1,150 plankton samples collected for analysis; no mussels detected;
- 80 citations issued by FWP game wardens for invasive species law violations.

"Thanks to our fantastic inspection crews and great cooperation by boaters, tribes, communities, ag and hydropower interests, and others, we were able to contain, so far, the spread of mussels in Montana," says Tom Woolf, AIS Bureau chief. ■



Sniffing out invasive mussels

PUBLIC ACCESS

DNRC, FWP team up to increase public access

There's no lack of places in Montana to hunt, fish, hike, or float. But can you get to them?

FWP has made public access a top priority. The department owns and manages 332 fishing access sites and 70 wildlife management areas. Its Block Management Program employs full-time and seasonal staff who work with landowners to enroll, manage, and coordinate hunting access on more than seven million acres of private and isolated public land statewide.

Still, one of the biggest public access challenges in Montana is opening up landlocked public lands. For instance, school trust and state forest lands, managed by the Montana Department of Natural Resources and Conservation (DNRC), are open to hunting, hiking, and several other types of outdoor recreation. But tens of thousands of acres are unmarked, completely surrounded by private property, or otherwise blocked off from public use.

Federal lands are even more inaccessible. According to the Center for Western Priorities, Montana has more landlocked public property—nearly two million acres—than any state.

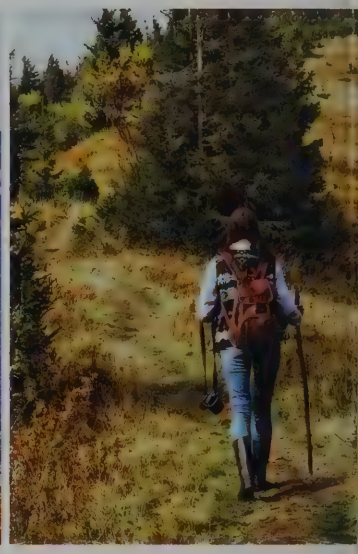
To help open more land to public use, in 2016 Governor Steve Bullock created a new state position of public access specialist at DNRC. The new specialist, Ryan Weiss, has driven across Montana meeting with hunters, landowners, and staff of DNRC, FWP, the Bureau of Land Management, and the U.S. Forest Service. "My idea for meeting with people isn't to pop in and say I have the solution, but to start a dialogue about what a solution might look like," Weiss says.

Topping the list of problems: a chronic lack of signs indicating state and federal land ownership, public lands surrounded by private property off limits to hunting, and illegally closed roads leading to public property. Often these properties are embroiled in lawsuits filed by public land advocates. Even before Weiss arrived, DNRC had been increasing state land access by posting more signs at section corners. The agency also won't accept land in swaps or other transactions that has no public access. "That's no longer negotiable," Weiss says.

Weiss, who was hired after working on property conflicts in New Mexico, says he received a crash course in Montana access issues from FWP game wardens, regional fishing access site coordinators, and program leaders. "They gave me a warm welcome and helped me get up to speed," he says.

Jason Kool, FWP Hunting Access Bureau chief, says Weiss is providing much-needed assistance in finding ways for recreationists to reach public lands. "One of his biggest contributions so far has been as a liaison among the different entities working on access issues," Kool says.

Also applauding Weiss's arrival is Bernie Lea, president of the Public Land and Water Access Association. His group often goes to court over disputed roads that, it alleges, are public and should allow access through private property to state and federal lands. Lea says he's encouraged by Weiss's plans to create a state public route inventory. "That would be a good start to helping clarify public access," Lea says.



DNRC's new public access specialist is helping increase access for hunting, hiking, and other public use on public lands across Montana.

Recently, DNRC launched the MT-PLAN program, which solicits donations to purchase public easements through private property to state and federal lands. DNRC will administer the donations, Weiss says, and then award grants to eligible groups to buy access easements. "Donations can be as little as one dollar," he says, "but we're hoping for larger contributions, too, so we can use MT-PLAN to unlock key lands for hiking, hunting, mountain biking, and other recreation."

For more information, call or e-mail Weiss at (406) 444-5576 or ryanweiss@mt.gov. ■

CARTOON ILLUSTRATION BY MIKE MORAN; PHOTOS, LEFT TO RIGHT: ALBERTA ENVIRONMENT AND SUSTAINABLE RESOURCE DEVELOPMENT; ED COYLE; SHUTTERSTOCK

FISHERIES

Paddlefish head home

This past summer, anglers and guides were surprised to see paddlefish in the Bighorn River's blue-ribbon trout water.

FWP fisheries biologists say that the arrival of paddlefish in the upper 13 miles of the Bighorn was unusual but not unprecedented.

Abundant snowfall last winter produced heavy spring runoff. Early, large releases from Yellowtail Dam, from which the Bighorn emanates at Fort Smith, apparently mimicked historical flows and water temperature. That compelled paddlefish in the lower Yellowstone River to move farther upstream than they had in decades.

Before the dam was built in 1967, the Bighorn River was inhabited by paddlefish, sauger, and other coolwater species. After Yellowtail Dam impounded the river, the water it released came from near the bottom of Bighorn Reservoir. Steady flows of cold water created the Bighorn River's world-class trout fishery.

With the big flush of water from the 2017 snowmelt, dam operators had to temporarily send water from the warmer upper level of the reservoir over the dam. Instinct kicked in, and paddlefish headed upstream to historic spawning waters.

As Bighorn River water levels and temperature dropped over the summer, paddlefish migrated back downstream to their fall and winter holes in the Yellowstone and then the Missouri River in North Dakota. ■

Crooked wood

The twisted, gnarled, stunted trees seen on subalpine hikes are known as *krummholz*, German for "crooked wood." A krummholz is usually a limber, whitebark, or subalpine pine that has been shaped by decades of intense cold and fierce wind. The elements kill the tree's growing tips, causing it to spread horizontally rather than rise up vertically. By growing low to the ground, a krummholz maintains a low profile and is less likely to be sheared off by gales that snap tops off taller trees. Krummholz are usually the oldest specimens of their tree species, sometimes living twice as long as normal-sized specimens.

Resembling trees from fictional Middle Earth, krummholz are known in some countries as elfinwood.

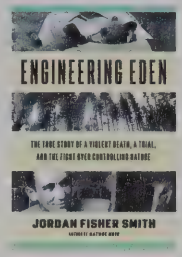
TOP TO BOTTOM: JENNIFER IDOL/ENGBRETSON UNDERWATER PHOTOGRAPHY; DEE LINNELL BLANK

Wrap up a good read

Books make wonderful gifts for the holidays. Here are two we recommend for *Montana Outdoors* readers:

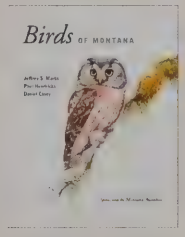
Engineering Eden, *by Jordan Fisher Smith. Crown Publishing. $28.*

To what extent should the National Parks Service intervene with nature? That was the question at the heart of a 1975 court case concerning a camper killed by a grizzly bear in Yellowstone National Park. In telling the story of that trial, Smith, a retired NPS ranger, writes a spirited history of the agency and its struggle to figure out how best to manage bears (and fire). The cast of characters includes John and Frank Craighead, A. Starker Leopold (son of Aldo), and senior Yellowstone scientists. The book is an essential read for anyone interested in YNP grizzly management and the critical role played by the Craighead brothers in understanding the Greater Yellowstone Ecosystem bear population.



Birds of Montana, *by Jeffrey S. Marks, Paul Hendricks, and Daniel Casey. Sponsored by Montana Audubon. Buteo Books. $75.*

No dedicated Montana bird fan should be without this massive 657-page tome. The comprehensive reference on the status, distribution, relative abundance, ecology, and conservation of the 433 bird species found in Montana includes a complete history of the state's ornithology and bird conservation efforts. Weighing 4.5 pounds, this is not a field guide but rather an essential reference for anyone interested in Big Sky Country bird life written by some of the state's top bird experts. ■



The Eagles Have Landed

Ten years after delisting under the Endangered Species Act, Montana's bald eagles are putting up numbers worth celebrating.

By Julie Lau. Photos by Kate Davis

"A skiff of snow, and everything starts to look like an eagle," says Kristi DuBois, a nongame wildlife biologist with Montana Fish, Wildlife & Parks. Fortunately, snow squalls are still holding off as she parks her truck along the Blackfoot River not far from Ovando. There's no mistaking the white-feathered head we spot on the other side, looking out from a massive construction of sticks and branches lodged high in a larch tree.

An adult bald eagle sitting on her nest, calmly studying the river below. That's all we need to see for now. This nest is active and occupied, one more bit of good news for Montana's resident bald eagles.

On this unsettled spring day, I am riding along with DuBois as she monitors bald eagle nests. It has been ten years since the species was declared "recovered" and delisted under the Endangered Species Act (ESA). Since then, Montana's nesting bald eagle population has continued to grow, far exceeding the original recovery goal. But while DuBois has shifted her work priorities to other species with greater needs, she and others are still, as she puts it, "keeping tabs on our national symbol."

Bald eagles have made a remarkable comeback. But DuBois knows that vigilance is still necessary. "We monitor to make sure they don't need to go back on the Endangered Species List," she says.

Just a few decades ago, prospects were grim for bald eagles in the lower 48 states. Montana was no exception. In 1978, the year bald eagles were listed as a federally endangered species, only 12 known nesting pairs remained in Montana.

Think about that for a moment—just a dozen pairs in a state covering 94 million acres, with thousands of miles of rivers and lakeshore. Bald eagles were on the brink of local extinction.

Julie Lue is a writer in Florence. Photographer Kate Davis is executive director of Raptors of the Rockies in Florence.

HEADING FOR TROUBLE

By the time it was federally listed, the bald eagle had been the United States' national emblem for almost 200 years. In 1782, the bird came to roost on the Great Seal, an image that today adorns passport covers, presidential podiums, and one-dollar bills. But before this iconic eagle clutched its first olive branch or bundle of arrows, the species was already an important symbol with spiritual and cultural significance for many Native American tribes. Some have long viewed the high-flying bald eagle as a "messenger to the creator."

Scientists estimate that, before 1776, as many as 250,000 bald eagles lived in what today is known as the Lower 48. (Alaska has always been home to more of the raptors than all other states combined, and eagles were never endangered there.) Montana likely held its fair share. In 1805, as the Corps of Discovery crossed what is now Montana's eastern border, Meriwether Lewis wrote: "The bald Eagle are more abundant here than I ever observed them in any part of the country."

As the human population grew, the bald eagle population shrank. Habitat disappeared as open land along waterways gave way to settlements and farms. Nesting trees were cut down to make space or provide fuel or lumber. At the same time, bald eagles were intentionally killed. As predators, the birds were seen as a nuisance, or even a danger. Though bald eagles eat mostly fish and carrion, people worried the large raptors would prey on livestock or even carry off small children. America's national bird was often shot on sight. No one, it seems, worried about running out of bald eagles. One 19th-century ornithologist even declared them "good eating, the flesh resembling veal in taste and tenderness."

Bald eagle populations responded with a steady downward slide in the late 1800s and early 1900s. In 1940, Congress attempted to slow the decline with the Bald Eagle Protection Act (later amended to include golden eagles), which made it illegal to hunt, sell, or possess eagles or their parts.

The large raptors soon faced an even worse threat than indiscriminate shooting and habitat loss: DDT, a popular pesticide sprayed on fields, forests, and towns after World War II. Because DDT's toxic effects

STILL LEARNING While its siblings watch, a young eagle struggles to land on a dead tree in the Bitterroot Valley.

HOME IMPROVEMENT An eagle carries material to its nest. Bald eagle nests are massive structures that can weigh more than 1,000 pounds.

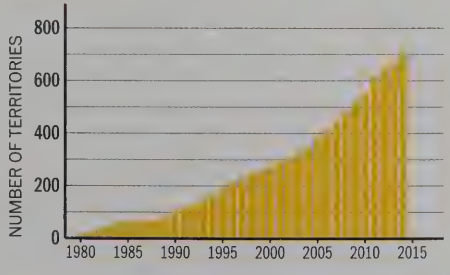
accumulated as it traveled up the food chain, raptors such as ospreys, peregrine falcons, and bald eagles were especially vulnerable. A byproduct of DDT caused the birds to produce eggshells too thin to support the weight of an incubating parent. Eggs were crushed, embryos died, and nests failed, year after year. By 1963, a year after publication of Rachel Carson's exposé on the environmental damage caused by pesticides, *Silent Spring*, only 417 nesting pairs remained in all of the Lower 48.

In 1972, DDT was banned in the United States for nearly all uses. But for bald eagles, a ban alone could not reverse the population decline. Numbers were too low to recover without federal intervention. In 1978, bald eagles were listed under the ESA, with a "threatened" designation for Michigan, Minnesota, Oregon, and Washington, and an "endangered" designation for the rest of the Lower 48.

SLOW RECOVERY

Even though the species was listed as endangered, Montanans still saw a fair number of bald eagles in winter, when migrating birds from Canada congregated here in search of milder weather or open water. Summer was a different story. "In terms of just driving around and seeing one, chances were about zero," says retired FWP biologist Dennis Flath, whose long career spanned both the low point for bald eagles and much of their recovery.

Montana Bald Eagle Nesting Population, 1980-2014



SOARING NUMBERS Over the past 35 years, bald eagle numbers have risen dramatically. According to Kristi DuBois, FWP nongame wildlife biologist, the population will soon level off as the raptors fill all available habitat. Montana lacks population figures for the past several years because biologists now spend time monitoring higher-priority species that aren't doing as well, DuBois says.

Biologists themselves took to the sky when FWP began surveying nests in 1980. Neither bald eagles nor their huge nests (known as aeries) are designed for camouflage. During spring aerial surveys, biologists can easily spot a nest in a cottonwood stand before the trees leaf out.

"I have no idea how much time I spent in the air," Flath says, referring to the countless hours he flew in helicopters and planes over drainages. As in other states, Montana wildlife agencies felt federal pressure to locate nests and nesting territories, both to protect them from disturbance and to track bald eagles' success or failure at producing fledglings.

Bald eagles didn't rebound quickly. Like other long-lived species—eagles can live 20 to 30 years—the big birds reproduce slowly. They don't nest until at least age five, and even then, a mating pair usually raises just one or two fledglings with each attempt.

To make recovery more challenging, bald

eagles found themselves crowded out by development. In eastern Montana, a long stretch of riparian habitat along the Missouri River had been swallowed up by the creation of Fort Peck Reservoir. Elsewhere, housing along the Bitterroot, Gallatin, Yellowstone, and other rivers replaced cottonwoods where eagles historically nested.

Yet bald eagles still made steady progress, helped by lower levels of toxins in the environment and stiffer penalties for harming the birds or their nests. As numbers crept up, monitoring became a joint effort involving state and federal agencies, tribes, conservation groups, private landowners, and others.

By 1990, Montana had passed its population goal of 99 nesting pairs. The species was downlisted to "threatened" in 1995, and delisted entirely in 2007. "The ESA did what it was supposed to do, which was to bring back our national symbol," DuBois says.

At the time of delisting, Montana was home to roughly 400 pairs. The population continued to grow. In 2014, biologists counted 700 nesting pairs, a number Flath finds "incredible."

Because bald eagles eat mainly fish and nest near water, Montana's population will never be as high as those in states with abundant lakes such as Minnesota (9,800 nesting pairs) and Florida (1,500 pairs). Even so, bald eagles are no longer uncommon in Montana. Anyone who spends an hour or two along any river or reservoir has a good chance of seeing one.

ROOM SERVICE An eagle delivers a mountain whitefish to its nearly fledged offspring. Because fish are an essential food for these raptors, pollution and other damage to aquatic ecosystems harmed eagle populations and contributed to their endangered species designation.

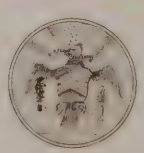
SPREADING THEIR WINGS

DuBois now sees signs that Montana may be reaching carrying capacity for nesting bald eagles. "In major river systems, most if not all of the best eagle habitat is already filled with eagles," she says. Some pairs are moving into territories that haven't held nesting eagles since before World War II, or are attempting to nest along smaller streams.

About a third of the nesting territories are monitored each year to see if they are occupied or eagles are incubating. Biologists check some of those later for fledglings. Allison Begley, FWP avian conservation biologist, says, "With so many nesting territories, it's been hard to keep up with how well nesting eagles are doing." Citizen scientists can help by submitting sightings of nestlings or fledglings to ebird.org or the Montana

TIMELINE: BALD EAGLE

Pre-1776: Roughly 250,000 bald eagles are thought to inhabit today's lower 48 states, occupying nearly every large river or lake.



1782: Charles Thomson sketches a design featuring a bald eagle. The Continental Congress ratifies this as the Great Seal of the United States, making the raptor the country's official symbol.

1850-1900: Pioneers and loggers cut down nesting trees for timber and fuel. The bald eagle population begins to decline.

1900-1940: While technically protected in 1918 by the Migratory Bird Treaty Act, tens of thousands of bald eagles are shot or poisoned by people who view the raptors as threats to livestock or want to collect feathers.

1940: Congress passes the Bald Eagle Protection Act, which prohibits the killing of bald eagles.

1950s: DDT becomes widely available as an insecticide and contaminates fish. Populations of piscivores like bald eagles begin to rapidly decline.

1963: A **417** National Audubon survey reports only 417 eagle nesting pairs, marking the low point for the species.

1972: DDT is banned for outdoor use. Bald eagles soon begin recovering.

1978: The eagle is declared endangered, becoming one of the first species protected under the Endangered Species Act in 1973.

1995: The eagle is reclassified from "endangered" to "threatened."

2007: The U.S. Department of the Interior declares the bald eagle recovered and removes Endangered Species Act protection.

2014: Montana biologists estimate the state bald eagle population at more than 700 nesting pairs, a 60-fold increase from the population's nadir in 1978.

Natural Heritage Program, Begley says.

FWP still places a high priority on documenting new nests and ensuring the peaceful coexistence of humans and eagles. Just like people, eagles need a little "elbow room," DuBois says. Human activity can scare adults off their nests, leaving eggs or small nestlings vulnerable to bad weather or predators like ravens. How well eagles tolerate disturbance varies greatly from pair to pair. Many don't seem bothered by the comings and goings of anglers, ranchers, and others nearby. Usually landowners who find themselves hosting a bald eagle nest can just "keep doing what they're doing, making sure to protect the habitat," DuBois says.

But landowners need a permit to remove a nest, even if there are no eggs or it appears unoccupied. Bald eagles and their nests are still protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act, which also governs a process by which Native Americans can obtain eagle feathers or parts for religious purposes.

ESA SUCCESS STORY Bald eagle numbers today are higher than they've been in decades. The remarkable population growth shows how the Endangered Species Act was designed to work: Recover species to where they no longer need full federal protection.

WHAT EAGLES NEED

DuBois says bald eagles will continue to thrive in Montana as long as they have "habitat for nest trees, healthy fisheries, a little bit of room, and a toxin-free, clean environment."

Despite strong population numbers, a problem in any one of these categories can spell trouble. Suitable habitats are squeezed out by development too close to rivers and lakeshores. Pollution and aquatic invasive species threaten healthy, diverse fisheries. Bald eagles are still unintentionally harmed by contaminants in their environment.

Lead exposure, which can sicken and even kill eagles, appears widespread. According to Rob Domenech, executive director of Missoula-based Raptor View Research Institute, over 90 percent of bald and golden eagles tested in collaboration with the nearby MPG Ranch in Florence showed elevated levels of lead. Bozeman-based Montana Raptor Conservation Center, which tests every eagle it receives, similarly finds that "about 90 percent" show evidence of lead exposure, says rehabilitation director Becky Kean. Eagles with high lead levels receive a treatment called chelation therapy. Of those brought to the center strictly because of lead poisoning (as opposed to fractures or other injuries), only about 20 percent survive. "It's extremely debilitating," says Kean.

Bald eagles pick up lead from their food, says Representative Janet Ellis, senior director of policy for Montana Audubon. The birds consume fragments of lead bullets when they scavenge elk and deer gut piles or ground squirrels and other rodents that have been shot. If lead levels are high enough, Ellis says, "sometimes it kills birds outright. At a minimum, it reduces their life." She adds that increasing numbers of hunters are aware of the problem and voluntarily switching to nontoxic copper bullets, which are becoming more comparable in price to lead.

Another threat to eagles is the loss of mature cottonwoods. In the years ahead, Ellis says, bald eagles may find fewer large nesting trees—especially in eastern Montana, where cottonwoods often provide the only option. Montana still has many big cottonwoods, but along stretches of river below dams, these trees are failing to regenerate. The understory beneath cottonwood stands is usually open, lacking saplings that represent eagle habitat down the road. "We predict that Montana will lose one-fourth of all cottonwood sites in the next 50 years," Ellis says.

Cottonwoods need a "big sloppy river system," with spring flooding and gradually declining water levels through the summer, Ellis explains. These naturally occurring conditions allow seeds to germinate and seedlings to grow. But dams control floods and keep floodplains from being inundated. As they struggle to regenerate, cottonwoods can be crowded out by exotic species like Russian olive and tamarisk (salt cedar)—shrubby trees too small to support eagle nests.

Fortunately, agencies and groups like FWP and Montana Audubon are working to help protect cottonwoods and other habitat, prevent the spread of invasive species, and reduce environmental contaminants.

Meanwhile, bald eagles continue to do their part. A snow squall has come and gone by the time DuBois and I head back from the Blackfoot River toward Missoula. She makes one last stop along a dirt road, next to an old farmhouse. Just outside a picket fence, high in a cottonwood, a bald eagle sits in her nest, quietly incubating the future.

Safe Passage

Bridges, tunnels, and other creative structures allow wildlife to cross U.S. Highway 93 on the Flathead Indian Reservation without ending up as roadkill. By Kylie Paul

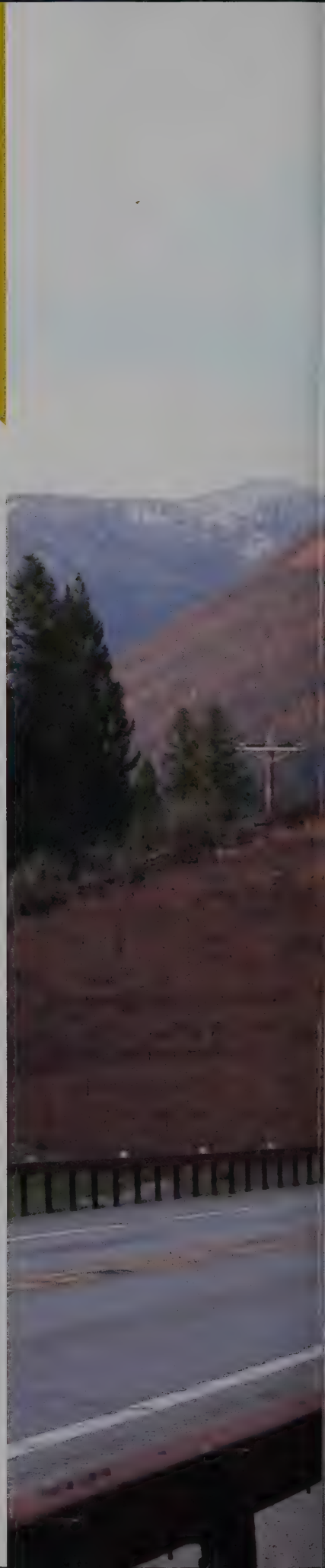
Most Montanans have a wildlife-vehicle collision story: the totaled pickup, the injured friend, the dead or wounded deer on the side of the road. Roadkill seems inevitable in a state with one of the nation's highest rates of deer, elk, and moose collisions. State Farm Insurance reported in 2017 that Montana drivers were second only to those in West Virginia in the number of per capita wildlife-related accidents.

But recently, state, federal, and tribal agencies in Montana have proved that wildlife can cross busy highways without endangering themselves or vehicles. The 56-mile stretch of U.S. Highway 93 North that bisects the Flathead Indian Reservation between Evaro and Polson is one of the most extensive wildlife-sensitive highway design projects in North America. There, the Confederated Salish and Kootenai Tribes (CSKT), Montana Department of Transportation, Federal Highway Administration, and other partners have found a way to use traffic engineering and knowledge of animal behavior to reduce wildlife mortalities and costly vehicle collisions.

Kylie Paul is a writer in Missoula.

Wildlife death trap

In the 1990s, the Department of Transportation proposed reconstructing this stretch of U.S. 93 to improve safety on what had become one of Montana's most dangerous roads for wildlife collisions. Because the CSKT are a sovereign nation, plans required extensive tribal involvement. In addition to state and federal requirements such as public safety and reasonable cost, the tribes asked that the project protect important cultural and natural resources along the corridor. The new highway also needed to reduce mortality of moose, deer, bears, mountain lions, and other wildlife. The animals



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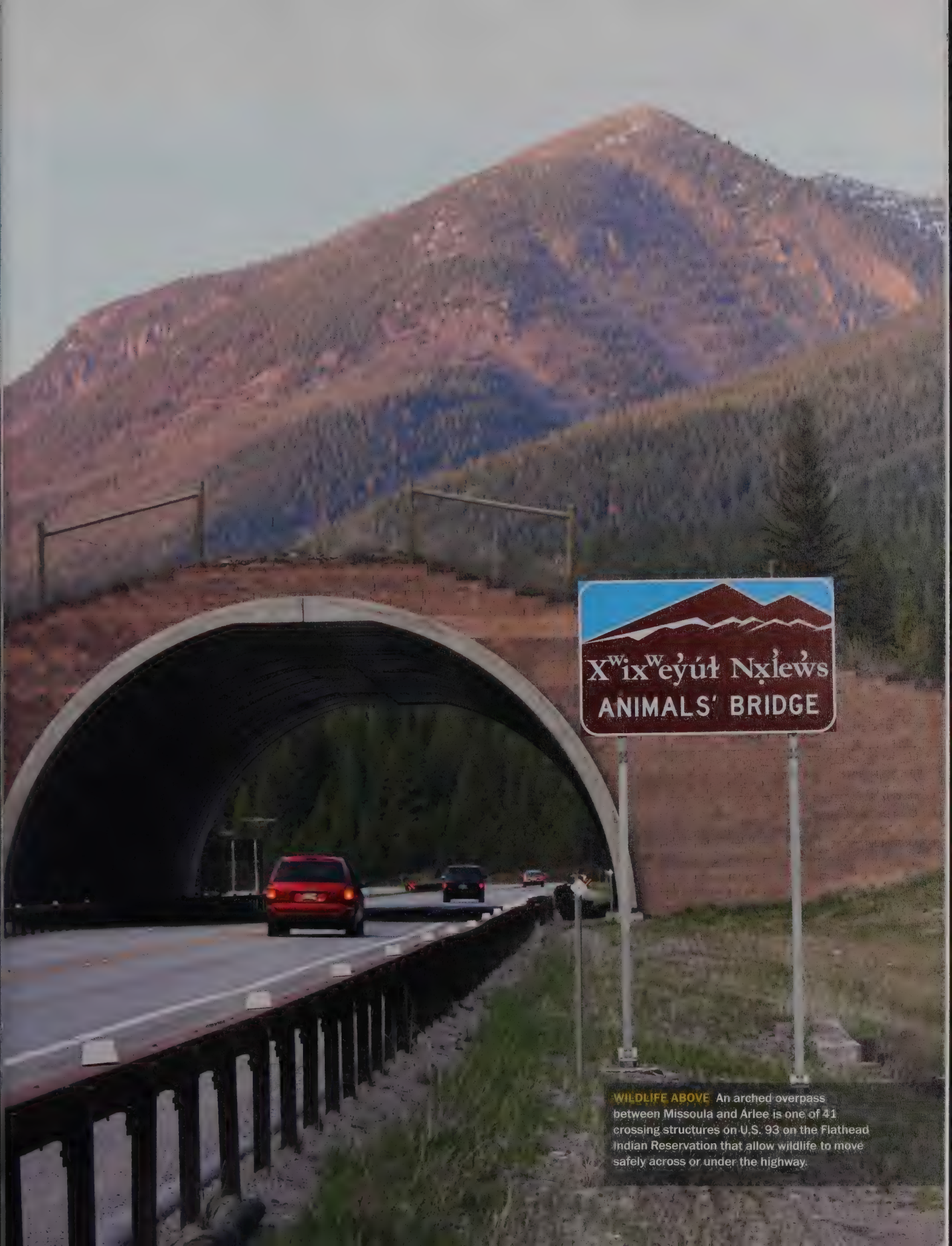


WILDLIFE ABOVE An arched overpass between Missoula and Arlee is one of 41 crossing structures on U.S. 93 on the Flathead Indian Reservation that allow wildlife to move safely across or under the highway.

regularly crossed the road through the fertile Flathead Valley, flanked by the Mission Mountains to the east and Salish Mountains to the west.

Tribal and state wildlife biologists, along with representatives of state and federal highway agencies, visited Banff National Park in Alberta, Canada, to learn about overpass and underpass structures. They also studied underground structures used successfully in Florida and Europe. After years of discussion and negotiation, the final design contained dozens of wildlife "mitigation measures."

Rebuilt from 2004 to 2010, the reconstruction of 56 miles of highway included installing 41 wildlife crossing structures ranging from small concrete culverts to large metal culverts and an arched overpass. On nearly nine miles of road, high fences keep wildlife off the highway and guide them to the crossing structures. More than 50 manmade hills along the highway fencing, called "jump-outs," allow wildlife to escape from traffic. Dozens of wildlife guards (similar to cattle guards) discourage hoofed mammals from entering the fenced highway at access roads.

> "Wildlife used these structures 22,648 times each year. That's 22,648 times drivers were not in danger of hitting an animal. It's a big deal."

NECESSARY? A doe lies dead on a Montana highway. To reduce collisions that kill wildlife and damage vehicles, wildlife biologists and highway engineers teamed up on U.S. Highway 93 to install crossing structures that drastically reduce accidents and injuries.

When deciding where to place the structures, engineers worked with biologists and others to identify known wildlife crossing sites and the places where most accidents occur. They also factored in land ownership, long-term likelihood of human development,and topography. "Unlike wildlife mitigation projects in other states and Alberta, which are usually on fully protected lands, this is a multiple-use landscape with farming, housing, and other development along with an incredible mix of wildlife species and habitat," says Dale Becker, CSKT Wildlife Program manager. "We had to get creative in blending engineering techniques with wildlife ecology and human development to come up with solutions."

Wildlife structure study

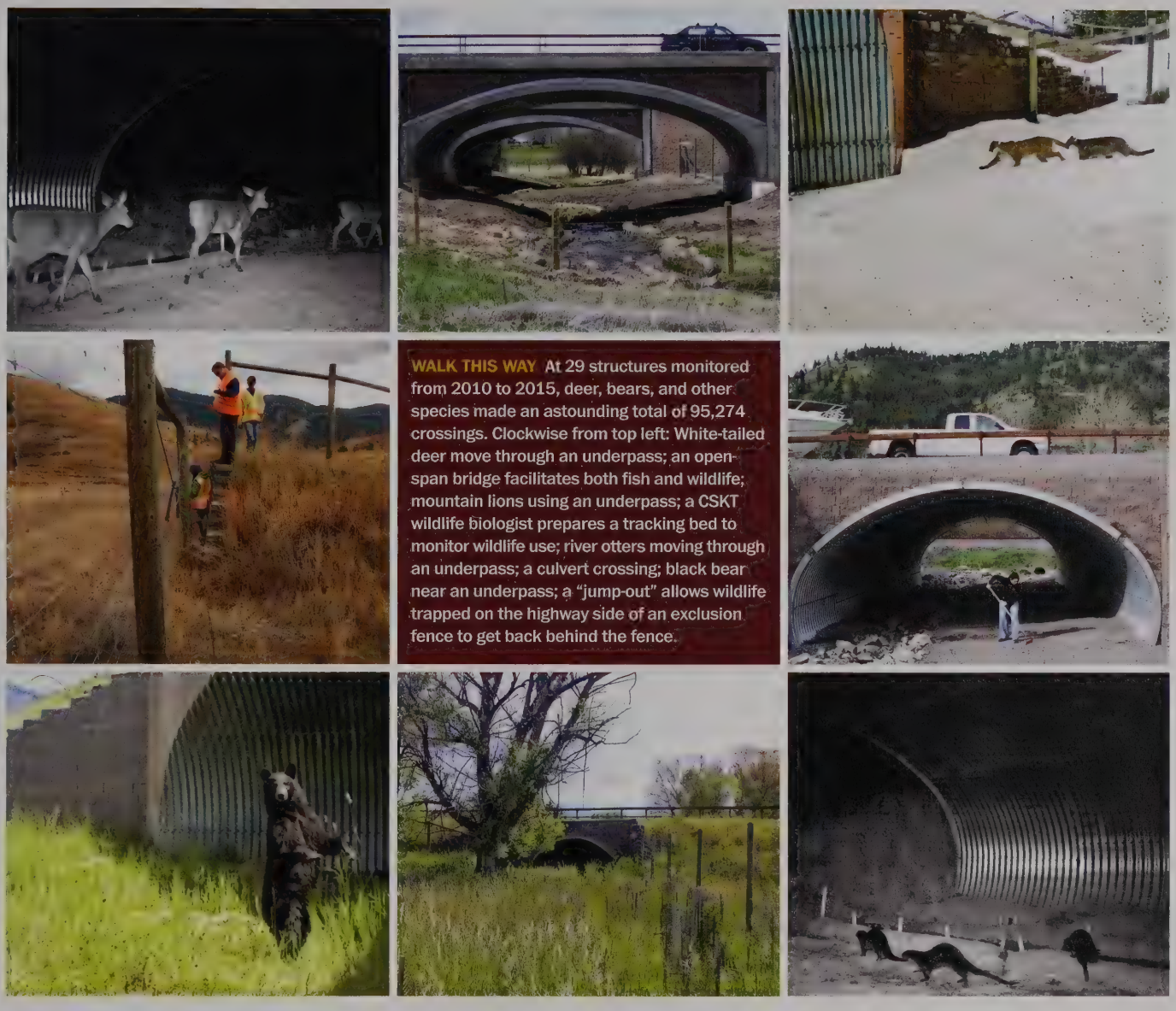
To document how well the U.S 93 project meets the goals of reducing collisions and allowing wildlife movement, researchers from the Western Transportation Institute (WTI) at Montana State University and the CSKT monitored highway accidents and wildlife use before and after the project was completed.

At 29 of the highway structures, cameras recorded a total of 95,274 wildlife crossings between 2010 and 2015. Roughly 20 medium-sized or large species used the structures, including grizzly and black bears, mountain lions, bobcats, elk, moose, and river otters. Biologists predict that use will continue to increase as more animals become familiar with the passageways. "The structures can be especially useful for animals that need to reach important habitat but may have viewed highways as obstacles or barriers to avoid," says Neil Anderson, the FWP regional wildlife manager in Kalispell.

As part of the WTI-CSKT study, researchers documented the number of times deer and bears crossed the highway before and after the new structures were installed. They found that bear crossings stayed the same and deer crossings actually increased. What that shows, says Marcel Huijser, WTI researcher and lead author of the study, is that even though wildlife can no longer traverse the highway wherever they want, the crossing structures maintain wildlife movement.

Every deer using an overpass or tunnel was a deer not on the pavement caught in some driver's headlights. According to Joe Weigand, Montana Department of Transportation Missoula District biologist, deer, black bears, and other wildlife used the structures on average 22,648 times each year. "That's 22,648 times drivers were not in danger of hitting an animal. It's a big deal," he says.

The study showed that wildlife-vehicle collisions were reduced significantly (70 to 80 percent) in areas with extensive lengths of high fence on both sides of the road. Yet where the highway was reconstructed without mitigation measures, wildlife-vehicle collisions increased from before. Huijser says that's because motorists tend to drive faster on smoother, wider, straighter roads that have increased sight-distances. "We now know that wildlife collisions are likely to increase when a highway is reconstructed with increased traffic speed," he says. This suggests that mitigation measures should always be considered in highway expansion or improvement projects in wildlife-rich



WALK THIS WAY At 29 structures monitored from 2010 to 2015, deer, bears, and other species made an astounding total of 95,274 crossings. Clockwise from top left: White-tailed deer move through an underpass; an open-span bridge facilitates both fish and wildlife; mountain lions using an underpass; a CSKT wildlife biologist prepares a tracking bed to monitor wildlife use; river otters moving through an underpass; a culvert crossing; black bear near an underpass; a "jump-out" allows wildlife trapped on the highway side of an exclusion fence to get back behind the fence.

CLOCKWISE FROM TOP LEFT: MDT & CSKT; CSKT; MDT; CSKT & WTI-MSU; CSKT; MDT & CSKT; KYLIE PAUL; MDT, CSKT & WTI-MSU; MDT

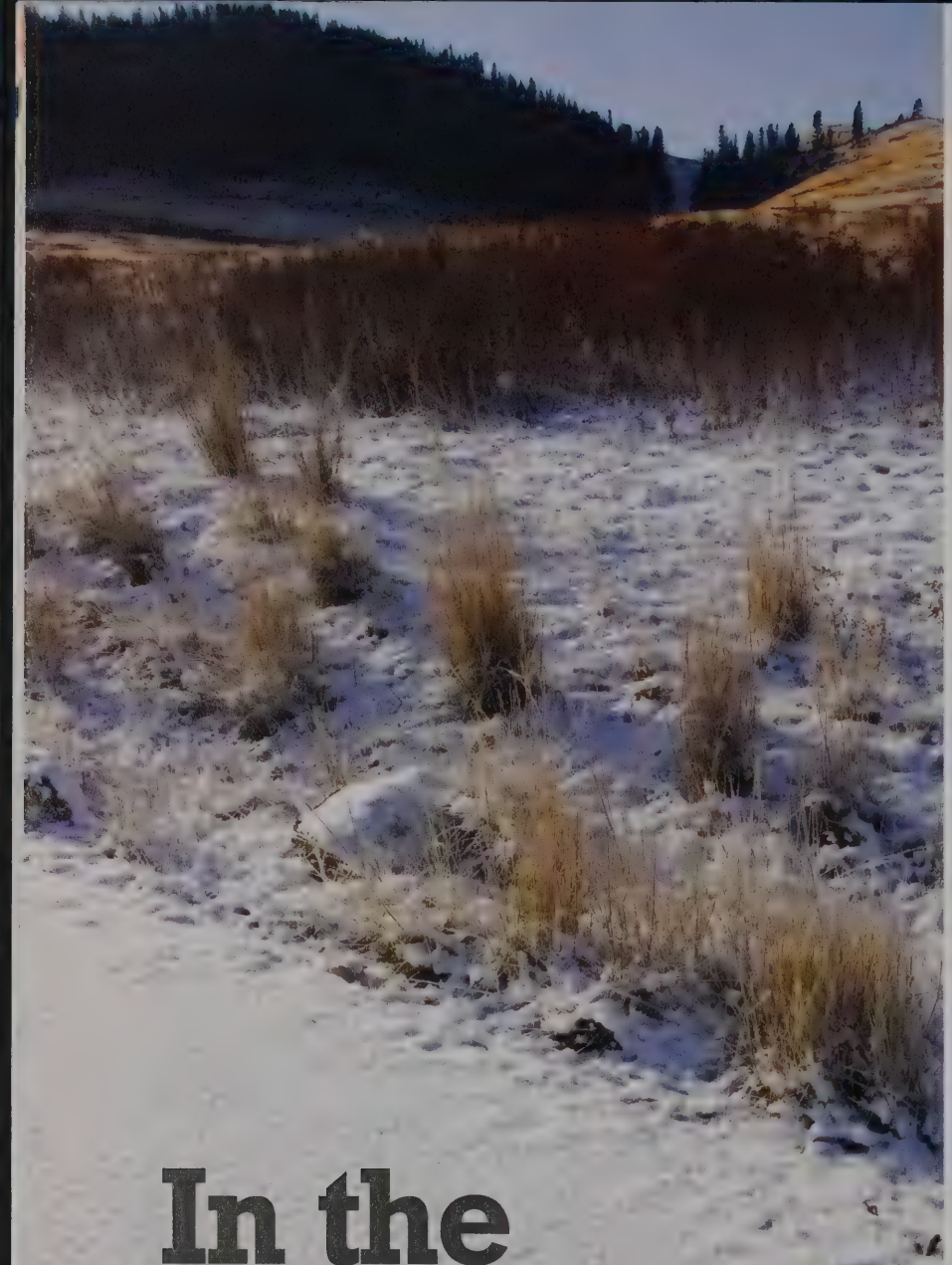
areas. "This project shows that we can improve human safety by reducing wildlife collisions at the same time as maintaining connectivity for wildlife," Huijser explains. "We can have our cake and eat it, too."

Wise investment

All wildlife fences along highways have to eventually end at some point. Because animals often walk along a fence until they can cross, fence endings can create roadkill hot spots. One solution is to reduce the number of fence endings by connecting fence segments. The study showed that longer wildlife fences, especially those over three miles long, significantly reduced collisions with large mammals compared to sections of highway with intermittent fencing. "Our results on the importance of longer fence lengths are expanding knowledge and improving practices across highway and wildlife agencies, and we're pretty proud of that," says Whisper Camel-Means, CSKT wildlife biologist.

Longer fencing is still needed to connect existing sections of short fences on the highway near St. Ignatius. Though grizzly bears use several underpasses, there's not enough fence to channel all the bears to those structures. Grizzlies continue to cross on the pavement and are hit by vehicles. Weigand says the Montana Department of Transportation has been working with the U.S. Fish & Wildlife Service and CSKT to extend fence lengths in these trouble spots.

The U.S. Highway 93 wildlife mitigation study offers a detailed list of recommendations for state, federal, and tribal wildlife agencies and highway departments to consider. Though mitigation infrastructure that reduces collisions can be seen as expensive in the short run, it can quickly pay for itself by reducing costly and dangerous vehicle collisions with wildlife. "From a public policy standpoint, it seems to be a wise investment in protecting both human safety and wildlife populations," Huijser says.



In the Driveway

Following a mountain lion from my house to the forest

By Bruce Smith

Aldo Leopold once wrote, "There are some who can live without wild things and some who cannot." Like Leopold, I'm one of the latter. So moving from rural Montana to a subdivision on the outskirts of Bozeman was a risk.

Bozeman is surrounded by spectacular public lands, but my wife Diana and I were used to walking out our front door, onto our own land, and finding ourselves immersed in wild things. Despite all the town has to offer, we wondered if Bozeman had enough nature to satisfy us.

But just 10 minutes south of town, we found a lovely little spot. The subdivision bordered a riparian zone that burst from the conifers of the Gallatin National Forest into a cottonwood gallery. Although just one-twentieth the size of our former property, the lot's habitat connected to vast public lands that made our new homestead a petite wildlife paradise. As my sister Sandy from Michigan said on a recent visit, "It seems so much larger than two and a half acres. Are you sure it isn't bigger?"

As a career wildlife biologist, I wanted to live on land big enough to support a wide diversity of birds, mammals, and reptiles. Considering Gallatin County's high property prices, I was seeking a spot that "seemed so much larger." Even on the edge of a major Montana town, the possibility of living among wild things does exist. As Diana and I have found in our new habitat, all you have to do is watch.

Two bird feeders hang outside the window of my home office. One day last December, as chickadees, finches, and other cheery species flitted to and from the seeds and suet, a whitetail fawn longingly examined the energy bonanza suspended from a zipline beyond a tall bear's reach. Suddenly the fawn went on high alert—tail flicked upright, ears pivoting right—then

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Bruce Smith is a retired U.S. Fish & Wildlife Service wildlife biologist. His latest book is Stories from Afield.

DONALD M. JONES

turned 90 degrees and faced something I could not see from my window. The deer stomped its front feet and trotted stiff-legged out of sight. Guessing that a neighbor's dog had wandered into the yard, I stepped to the window. In the middle of the driveway sat a bobcat, laser focused on the fawn. Then the bobcat rose, stretched, and slunk into a nearby shrub thicket as the brazen fawn returned and sniffed the spot where the predator had sat. After following the scent a short way, the fawn apparently lost interest. It wandered down our driveway toward the neighbor's ornamental plantings that poked through the blanket of snow.

Two mornings later, I opened the garage door to find suspicious tracks. They coursed the full 200-foot length of our driveway. Clearly registered in the overnight snowfall, the animal's clawless footprints measured three and one-quarter inches wide, the stride nearly three feet long. The first evidence of a mountain lion at our new home.

Having watched a lion glide effortlessly through a forest in Wyoming years ago, I could picture this one treading silently past the garage, through the wheatgrass meadow beyond, and down the bank toward the frozen creek. What most impressed me about that Wyoming lion was how purposefully it placed each paw. Picture your house cat slinking through the garden as darkness falls at dusk. It too moves deliberately, but on a scale one-tenth the lion's size.

An hour later, when I returned from an appointment in town, the lion's trail remained perfectly preserved in the snow. I told Diana I planned to track it awhile. Knowing me all too well, her urge to talk me out of it quickly turned to suggesting I take along a canister of pepper spray.

For a joyful 20 minutes I stalked the solitary hunter, much as the fawn had followed the bobcat—a carnivore capable of bringing down a young deer. But like me, the fawn was merely inquiring: What's this cat doing in "my territory," the place where I live?

Down the bank, then through alder, hawthorn, chokecherry, and wild rose thickets beneath the cottonwood gallery, the lion had padded beside the creek. Farther ahead it followed the same game trail I often walk looking for kingfishers, mink, and grouse. The tracks indicated nothing exciting or even especially interesting. The hunter neither stalked a deer nor returned to a previous meal stashed beneath branches and litter. It just continued along the stream, perhaps patrolling its territory to ward off intruders. Like other predators, mountain lions spend endless hours just roaming the places where they live. They commonly do so unnoticed by humans, though they see, hear, and smell us.

Experience with nature breeds familiarity that allows us to replace fear with respect and even admiration.

Later that day I e-mailed my sister about tracking the lion. She lives in a far more civilized setting, where wildlife encounters are largely limited to squirrels, rabbits, and frogs. During her fall visit, she'd been taken aback when I pointed out fresh black bear tracks in the moist soil just a few yards from our house. A lion in the yard might confirm it was only a matter of time before some famished beast devoured us.

Her reply to my e-mail read, "I would have been scared (just a little) but would have loved to see those footprints or better yet the real thing from inside the house! Hope you had a gun with you when you tracked him."

Like Sandy, most people consider wild carnivores a potential threat. I once shared that fear. But after years working around bears, lions, and wolves, packing a gun that day never crossed my mind. Out of curiosity, I've tracked lions before. And while studying the travels, survival, and ultimate demise of elk, I've on occasion displaced lions and bears from the remains of radio-collared research animals. That lifetime of experience has shaped my views of these integral components of ecosystems and how to move and live among them. Like those of so many less fortunate than I am, my sister's reaction was shaped not by experience but by a survival instinct passed down through our ancient ancestors' DNA. Fear fostered survival when early human hunters were just as likely to be prey. Experience with nature breeds familiarity that allows us to replace fear with respect and even admiration.

Nowadays it's the wild animals that have the most to fear, as humans blanket the planet and redesign nature to suit our needs and whims. As the wildland-urban interface expands into previously undeveloped wild spaces, contact and conflict between wildlife and humans intensifies. Space-limited deer, moose, and elk tolerate barking dogs, speeding cars, and run-ins with people as they try to fulfill their vital needs. Coyotes, bears, bobcats, lions, and other predators profit from unsecured garbage and pet foods or follow their prey into our neighborhoods.

Sustaining our wildlife heritage requires respecting each animal's right both to coexist with us and to stay independent from us. Wildlife needs to remain wild. Resisting the urge to feed and coddle wildlife keeps potentially dangerous animals from losing their fear of humans while allowing us to harmoniously share the land with them. That arrangement is both a privilege and a responsibility in an increasingly human-dominated landscape.

For many of us living in the mountain West, and elsewhere, sharing our surroundings with wild things enriches our lives, be it the flitting of wings outside our windows or tracks that one morning unexpectedly appear from nowhere in the driveway.

Doing just fine

We have heaters, parkas, and freezers full of food. Wildlife have found their own ways to survive winter.

WHITE-TAILED PTARMIGAN
Donald M. Jones

Clockwise from top:

RED FOX
Melonie Eva

BIGHORN SHEEP
Thomas Chadwick

NORTHERN RIVER OTTER
Cindy Goeddel

Winter is a fact of life in Montana, and often of death, too.

The worst one in state history may have been the winter of 1886-87. It began with a storm in November that left a one-inch crust of ice across the prairie. A December blizzard followed, then brutal cold in late January that sent temperatures plummeting down to minus 60 degrees F. near Miles City. Cattle ranches lost 50 to 75 percent of their herds, a tragedy immortalized in Charlie Russell's painting of a single starving steer, Waiting for a Chinook (One of 5,000).

Even in recent memory, cold and snow reached near unbearable

Clockwise from top left: **GRIZZLY BEAR** Tim Rubbert; **WHITE-TAILED JACKRABBIT** Francis C. Bergquist; **PRONGHORN** Laura Verhaeghe

levels. Record snows fell across the state in the winter of 1971-72. During an Arctic freeze in late January 1989, temperatures dropped to minus 52 degrees F. in Wisdom. The winter of 1996-97 shattered snowfall records again, especially in the state's western half, where Flathead Valley residents struggled to dig out from under 12 feet of snow. The winter of 2010-11 dumped so much snow on eastern Montana that trains had to be fitted with plows. Pronghorn and mule deer died by the thousands.

Humans adapted to winter by inventing central heating, double-pane windows, and Thinsulate. Wildlife have found other strategies.

One is to leave. Most Montana breeding bird species head to the Gulf or Pacific Coasts, Mexico, or Central America. Those that stay are well endowed to endure the harsh conditions. Dense feathers extending down to their feet insulate sharp-tailed grouse from the cold. Magpies and crows survive on roadkill, which increases in winter as deer cruise

Clockwise from top:

BOBCAT WITH MALLARD
Cindy Goeddel

MOUNTAIN GOAT
Bruce Becker

AMERICAN ROBIN
Carol Polich

roadsides looking for exposed vegetation. Dusky (blue) grouse actually head uphill in winter, living off fir and pine needles while roosting in thick conifer stands. To avoid predation, willow ptarmigan and snowshoe hares turn white and disappear into their snowy surroundings.

Beavers, pikas, red squirrels, and Clark's nutcrackers cache food during late summer and fall for later retrieval. Badgers burrow underground below the frost line and stay cozy in their dens, emerging occasionally to hunt ground squirrels, deer mice, or meadow voles. Small rodents spend winter scurrying through labyrinths of snow tunnels, feeding on seeds, sedges, and other bits of stored food when they aren't fleeing predators.

Some animals snooze through winter. The deepest sleepers are ground squirrels, whose rate of breathing plummets from 200 breaths per minute to just one or two. With no flying insects to eat in winter, bats survive by

Clockwise from top left: **AMERICAN BEAVER** Ken Archer; **HUNGARIAN PARTRIDGE** Donald M. Jones; **REMAINS OF A DUCK** Joel Maes; **PINE SQUIRREL** Diana L. Vasseur

entering a state of semi-hibernation known as extended torpor. While hanging upside down in caves, barn lofts, and other "hibernacula," the winged mammals' body temperature declines and their metabolism slows to conserve energy.

Black bears and grizzly bears enter a similar semi-hibernation, waking occasionally in their dens—notably to give birth (nature's most effective alarm clock)—before falling back asleep.

Wild mammals that stay above ground grow specialized coats. Deer and elk have hollow hair that traps body heat. Otter and beaver pelts are so dense that water can't reach the skin. A thick, woolly undercoat beneath a shaggy outer layer allows mountain goats to endure the most bitter cold.

Deer, elk, and other wild ungulates survive primarily on fat reserves built up in summer and fall when food was plentiful. Wolves, coyotes,

Clockwise from top: **PRAIRIE DOG** Donna Ridgway; **AMERICAN BADGER** John Juracek; **MULE DEER** Dick Walker; **TRUMPETER SWAN** Jason Savage

mountain lions, weasels, and other predators hunt year round. The cold season can be generous to meat eaters. Prey are weaker, more concentrated in their winter range, and often unable to escape pursuit.

Is there anything we can do to help wildlife make it to spring? Bird feeders can sustain individual chickadees, house sparrows, and juncos—plus the sharp-shinned hawks, pygmy owls, and house cats that feed on suburban songbirds. But that food supply is too minor to assist entire wildlife populations.

Feeding deer or elk, meanwhile, is not only illegal but often harms the very animals it aims to assist. Their complex digestive tracts are made to handle low-protein foods in winter, not the cracked corn, barley, and other high-protein morsels well-meaning people often put out. An elk or deer can actually die of intestinal infection with a stomach full of grain.

Above: **COYOTE**
Ed Coyle

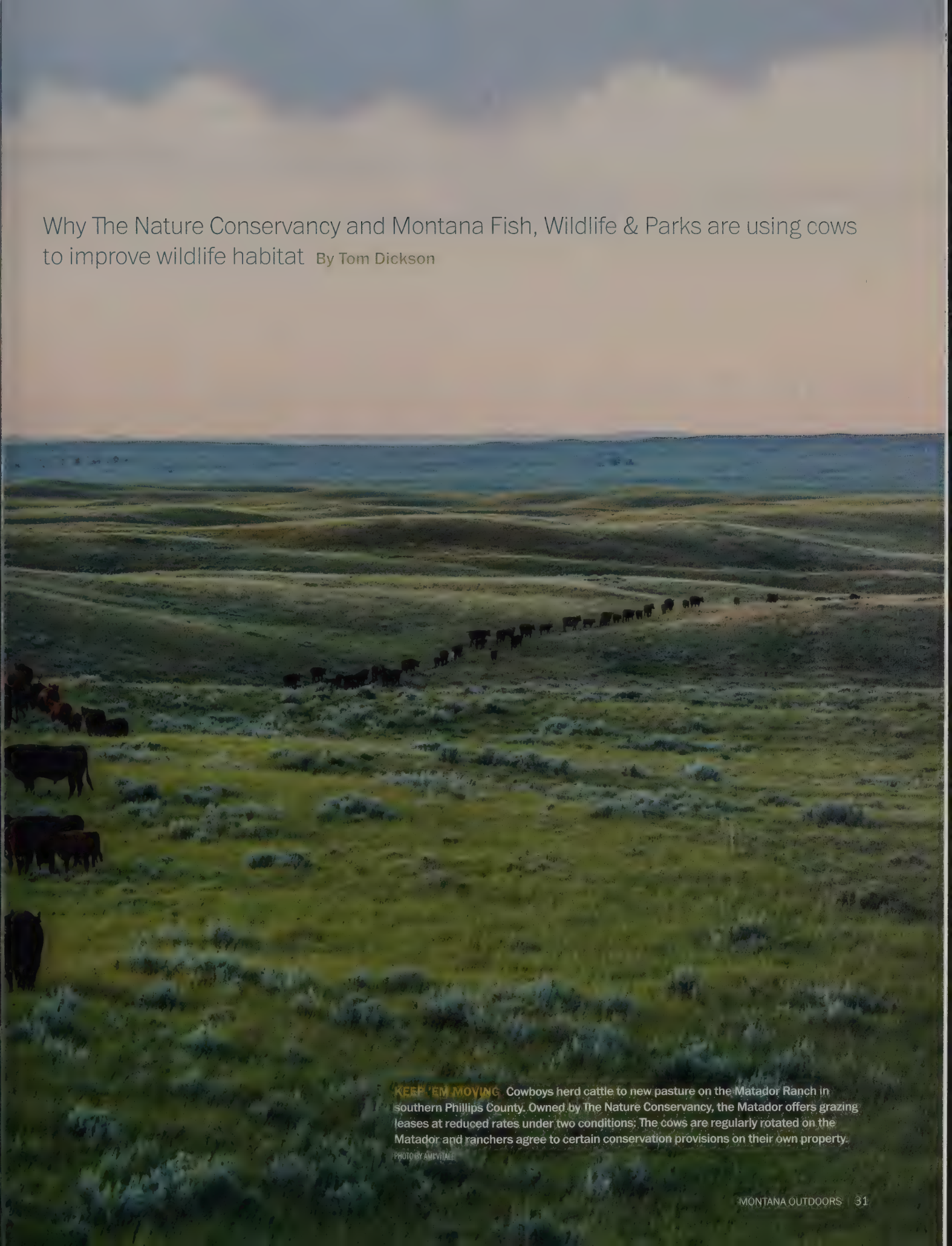
Two things do help. One is protecting winter habitat, from dense conifer stands in forests to cattail sloughs and tracts of native grass in prairies. The more suitable habitat that wildlife can use, the better they can withstand what winter sends their way.

Another is regulated hunting. Lacking natural predators, deer, elk, and pronghorn can quickly overpopulate their living spaces. When winter rolls in, there's not enough food or shelter for all, and the young, weak, and sick die of cold and hunger. By using hunting to maintain populations at appropriate levels, wildlife biologists keep game numbers in proportion to available habitat.

While winter here in the Far North can be cruel, wildlife have found ways to survive and even thrive in conditions that to us often seem unlivable. For the most part, all we can do is observe and marvel at their ingeniously effective survival adaptations and strategies.

GREEN GRAZING

Why The Nature Conservancy and Montana Fish, Wildlife & Parks are using cows to improve wildlife habitat By Tom Dickson



KEEP 'EM MOVING Cowboys herd cattle to new pasture on the Matador Ranch in southern Phillips County. Owned by The Nature Conservancy, the Matador offers grazing leases at reduced rates under two conditions: The cows are regularly rotated on the Matador and ranchers agree to certain conservation provisions on their own property.

PHOTO BY AMEVITALE

Brian Martin drives to the top of a rise on the Matador Ranch overlooking a prairie stretching for miles in all directions. The landscape appears uniform to a first-time visitor until Martin, conservation director for The Nature Conservancy (TNC) Montana, points out the diversity in this vast grassland. Some clay pans are nearly barren. Stands of green needlegrass and little bluestem grow a foot tall. In the distance, knee-high grasses rise amid clumps of Wyoming big sagebrush.

Martin explains how the varying plant heights benefit different bird species here in southern Phillips County, about 80 miles south of the Canadian border. Mountain plovers prefer short grass. Baird's sparrows do better in tall grass. Long-billed curlews need a range of short and midsize vegetation. "Every species has a unique combination of heights it needs throughout its life cycle," Martin says.

As if on cue, three sage-grouse glide past, topping a knoll and disappearing into what biologists consider some of the best mixed-grass prairie habitat in North America. The continent's longest pronghorn migration bisects the ranch, which TNC has owned since 2000. Burrowing owls and black-tailed prairie dogs thrive here, too.

Then, amid this prairie wildlife nirvana, I spot a herd of grazing black Angus.

A problem? Hardly. Cows are not only welcome on the Matador, but their endless appetite is essential to enhancing wildlife habitat. "If not for cattle, we wouldn't have nearly the number and diversity of birds and other wildlife we have here," says Charlie Messerly, ranch manager.

As on the Matador, many landowners across Montana use various types of "rotational" cattle grazing to increase both wildlife habitat and their bottom line. Montana Fish, Wildlife & Parks also is on board with the practice at more than a dozen wildlife management areas (WMAs).

Allowing cows on wildlife lands can raise eyebrows, even hackles. "On a few WMAs, hunters definitely don't like seeing cattle," says Kelvin Johnson, FWP's statewide wildlife habitat biologist. "We have to explain that, even though you might have to step over a few cow pies, cows are actually doing elk and other wildlife a lot of good."

BIGGER CONSERVATION FOOTPRINT The Nature Conservancy Montana's conservation director, Brian Martin, works out a grazing management plan with rancher Bud Walsh. As FWP does on its wildlife management areas, TNC discounts grazing on its Matador Ranch property as incentive for adjacent ranchers to use wildlife-friendly grazing on their own land.

COMPOUNDED INTEREST

Martin hears the same concerns from first-time guests at the Matador. "They'll say, 'Wow, what an amazing prairie. Too bad about the cows.'" He points out that prairie plants evolved with thousands of years of grazing by bison herds. Grasses and forbs (broad-leafed plants) need periodic cropping to produce their full potential. TNC uses cattle grazing—along with carefully controlled burns—to create a mosaic of vegetation that benefits a wide range of native birds, mimicking how migrating bison once created similar patchworks across the Great Plains.

At 60,000 acres, the Matador is the region's largest private ranch. In 2003, TNC set up a "grass bank" there, based on one established by another conservation organization in New Mexico. Surrounding ranches graze their cows on the Matador at steep discounts if they conduct certain wildlife-friendly practices—such as using rotational grazing or protecting prairie dog colonies—

Tom Dickson is editor of Montana Outdoors.

VARYING HEIGHTS Conservation grazing can produce a wide range of plant heights depending on the time of year, grazing duration, and number of cattle. Top left: Short grasses on prairie near Mosby. Top right: Mid-height grasslands near Cascade. Above left: Taller grass and sagebrush in Phillips County. Above right: If cows are quickly moved off afterward, even intensively grazed areas like this can quickly regenerate to resemble the photo at left.

on their own properties. Most important, no ranch can be in the grass bank if it plows up prairie to plant crops. "Once you turn soil over, it's pretty much lost forever for native birds," says Martin. Operating on tight margins, ranchers can feel pressed to convert prairie to row crops. "The grass bank helps provide an alternative," Martin says.

> "Even though you might have to step over a few cow pies, cows are actually doing elk and other wildlife a lot of good."

In this way, TNC uses the Matador grass to expand its wildlife conservation footprint on an additional 285,000 acres of grazing land.

The grazing arrangement makes business sense, too. One participating rancher is Dale Veseth, who joined the grass bank at its inception. "With rotational grazing here and on the Matador, we get higher calf weights and grow more grass that we can stockpile for dry years like we just had," he says.

CHEWED DOWN

That some grazing regimes benefit birds and other wildlife doesn't mean they all do. When not properly managed, cattle can harm the environment, especially in dry Western states like Nevada and Utah, where rangeland didn't historically evolve with grazing bison.

The worst effects come from chronic overgrazing. When rangeland is chewed down year after year, vegetation can't produce seeds or regenerate. That robs prairie birds of nesting habitat and cover to escape predators. Grazing cattle also stunt the growth of woody plants such as chokecherries, dogwood, aspen, and ash.

On streams, improperly managed cows can trample banks, creating silt that covers spawning gravel and suffocates fish eggs and aquatic insects. Bank trampling also hampers growth of streamside willows that historically kept streams cool in Montana's hot summers.

Even when cattle don't overgraze range, grazing management can still cause problems for some native bird species. Cattle are often managed to graze vegetation halfway

CLOCKWISE FROM TOP LEFT: JOHN LAMBING; JOHN LAMBING; JOEL MASS; JOHN LAMBING

down from one pasture to the next. This "managing for the middle" can maximize livestock weights, but it creates uniform mid-level grass height of less value to the birds that require taller or shorter vegetation.

GIVING PLANTS A BREAK

Surprisingly, the very grazing that degrades wildlife habitat can, with some tweaking, actually make it thrive. Most beneficial is rotational grazing. Under this approach, cattle are allowed to eat grass for shorter periods in specific areas while other pasture rests. Rotational grazing comes in several variations, all of which aim to give prairie plants a break to replenish energy in root systems, regenerate, and produce seeds before cows return.

Wouldn't it be best to just leave grasslands alone entirely? Actually, no. Periodic trimming reinvigorates grasses and forbs. It also reduces accumulated dried fuels, which can produce ultrahot wildfires that incinerate seeds and sterilize soil. Plus, cows' nitrogen-rich urine and dung fertilize the soil.

That's not to say every herd you pass on the highway is making grassland birds and other wildlife happy. But more and more ranchers are discovering the ecological and economic value of regularly resting pasture. "When done under a well-considered plan, we've found again and again that grazing can improve rangeland health and wildlife habitat while increasing calf weaning weights and reproductive rates, improving herd health, and lowering ranch operating costs," says Todd Graham of Ranch Advisory Partners, a Bozeman firm that helps ranchers boost both profits and ecosystem health.

Fish and wildlife conservation groups, longtime opponents of public land grazing, have recently begun to help ranchers find the sweet spot where wildlife and livestock objectives overlap. The National Audubon Society, National Wildlife Federation, and Trout Unlimited provide economic incentives for ranchers to manage cattle in ways that protect streams and native plants.

Rotational grazing is nothing new. For centuries, herdsmen in Africa, Asia, and Europe have nudged their cattle, sheep, and goats from one pasture to the next. In the early 1900s, after observing that plants

GRAZING GURU A young "Gus" Hormay studies the effects of grazing on plant physiology in 1938. FWP biologists later worked with Hormay to develop rotational grazing systems on several Montana wildlife management areas.

Grazing intensity, vegetation height, bird use

EXCESSIVE ← HEAVY — MODERATE — LIGHT → NONE

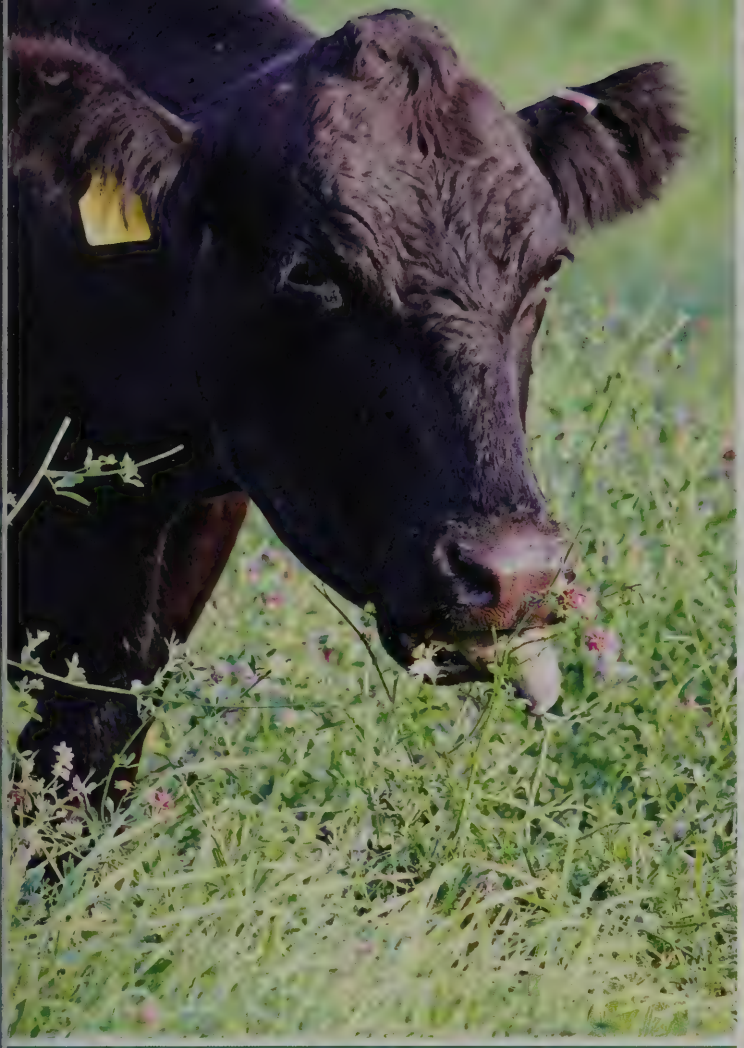
- Mountain plover
- McCown's longspur
- Ferruginous hawk
- Long-billed curlew
- Lark bunting
- Chestnut-collared longspur
- Baird's sparrow
- Sprague's pipit
- Sage-grouse

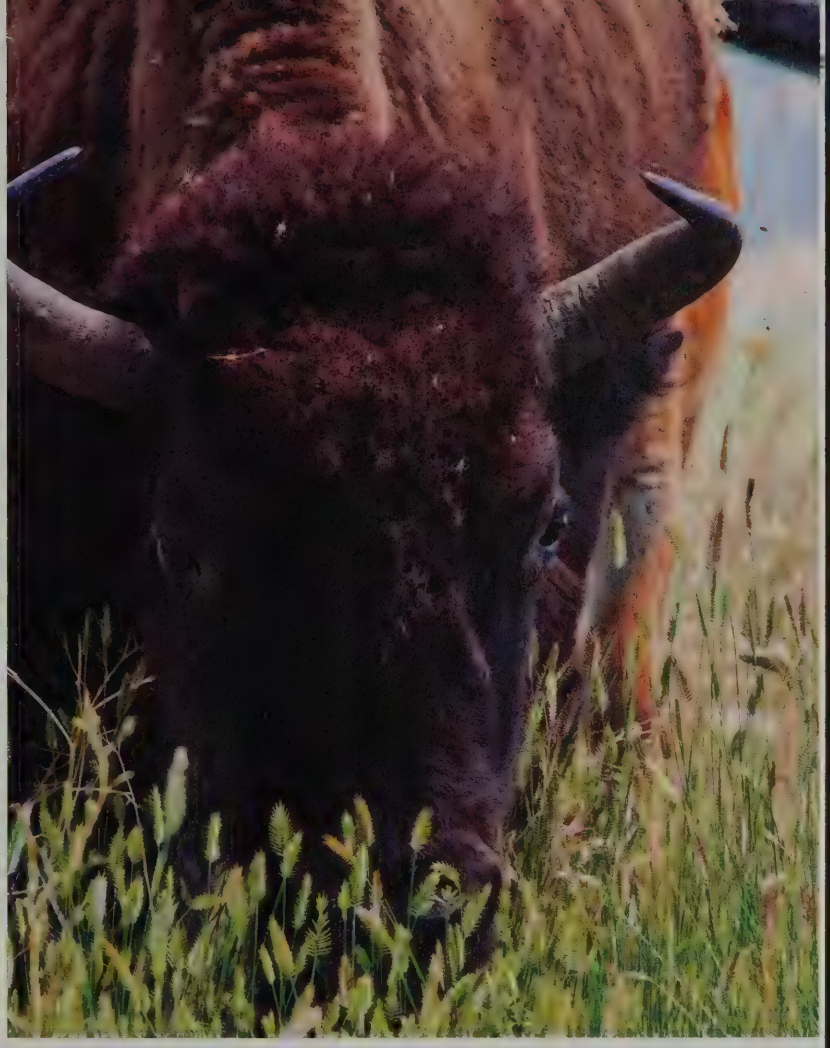
Historically, bison were kept moving across the northern Great Plains by wolf packs and human hunters. Grazing intensity varied widely, and bird species adapted to various vegetation heights. When cattle displaced bison in the late 19th century, grazing practices often produced only medium-level grass heights of less value to species requiring taller or shorter vegetation.

Illustration adapted from "Prairie Legacies—Birds" in *Prairie Conservation*, by Fritz L. Knopf. A senior research wildlife biologist with the U.S. Geological Survey, Knopf was widely regarded as one of the nation's foremost experts on prairie bird ecology.

BARE ← SHORT — MEDIUM → TALL/SHRUB

CLOCKWISE FROM ABOVE LEFT: MONTANA STATE UNIVERSITY LIBRARIES, SPECIAL COLLECTIONS; KRISTEN A. OSTBERG; STEVEN AMOS; SHUTTERSTOCK; JOHN CARLSON





FOR BIRDS, NO DIFFERENCE When moved periodically as part of conservation grazing regimes, cattle can provide the vegetation height diversity that benefits grassland birds just as migrating bison herds did historically. Lark buntings (below right) and Baird's sparrows (below left) are attracted to grazing patterns that produce a range of short to mid-height grasses.

could not survive and reproduce without periodic respite, range ecology pioneer Arthur Sampson developed the first systemized approach to deferred rotation in the United States. A student of Sampson's, August "Gus" Hormay, developed and advanced "rest-rotation" grazing and, working for the Bureau of Land Management, began promoting it across the West starting in the 1950s.

Despite the advantages rotational grazing offers, it's not for everyone. "The returns are beneficial, but up-front costs can be a barrier," says Veseth. By moving cattle more often, rotational grazing requires more labor, fencing, and water sources. "In the long run you get more grass overall, but some people can't afford to wait that long," Veseth says.

COWS ON WMAS

On a sunny September morning, FWP wildlife biologist Cory Loecker carefully maneuvers his rig up a rocky, ragged two-track toward the top of Beartooth Wildlife Management Area, on the northern end of the Big Belt Mountains. As part of an FWP lease, several hundred cattle owned by Sieben Livestock Company have spent the past few weeks grazing the area. Sieben has run cattle on 6,000 acres of the 36,000-acre WMA since 1992 as part of a vegetation regeneration management agreement. Crews use portable electric "poly-wire" fence to contain the cattle for a few weeks at a time before moving them to new areas.

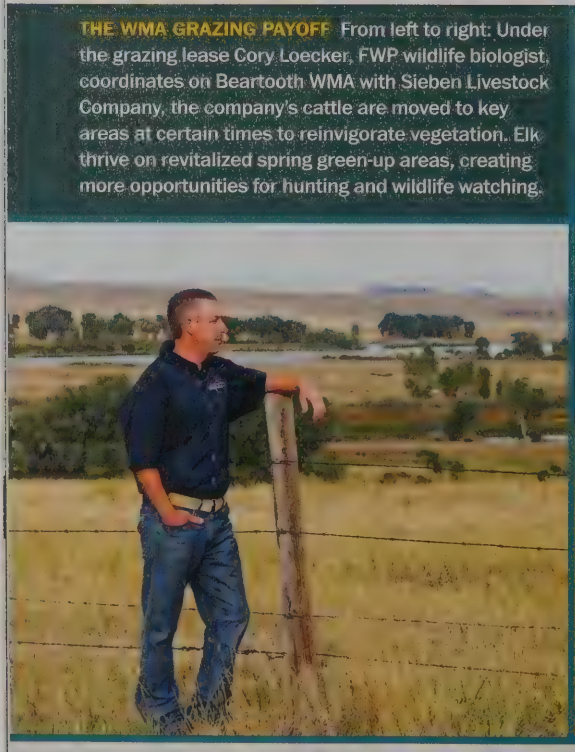
Loecker, who grew up working on Nebraska ranches, shows me a waist-high stand of smooth brome grass that hasn't been grazed in years. "Elk don't like to use old, coarse stuff like this except as maybe hiding areas for calves," he says. We walk to a trampled pasture that was heavily grazed a few days earlier. "It looks a little rough now, but this fall and next spring this will be filled with new grass shoots," Loecker says. "Elk key in on these green-up areas, basically following where cattle had been a few months earlier."

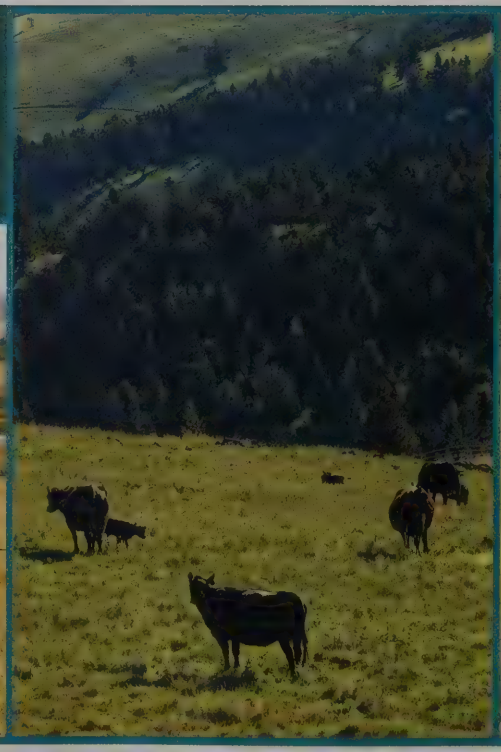
> "We put cows on our properties only if we're sure it will benefit specific species."

Most FWP grazing leases include provisions known as "cooperative agreements" that extend the WMA's conservation footprint. As on TNC's Matador Ranch, FWP discounts grazing fees if neighbors agree to rotationally graze their own lands, too. "That improves habitat far beyond the wildlife area boundaries," says Rick Northrup, chief of the FWP Wildlife Habitat Bureau. Many leasees also provide public hunting access on their land, an added benefit.

In addition to the 115,000 WMA acres leased statewide for conservation grazing, another 90,000 acres of pasture is periodically rested on adjacent ranches and other leased lands as part of the agreements. Says Kelvin Johnson, the FWP wildlife habitat biologist, "Landowners have told me they wanted to defer grazing on their land to rest the vegetation, but they couldn't afford to until they leased with us."

WMA grazing can even be adjusted to





THE WMA GRAZING PAYOFF From left to right: Under the grazing lease Cory Loecker, FWP wildlife biologist, coordinates on Beartooth WMA with Sieben Livestock Company, the company's cattle are moved to key areas at certain times to reinvigorate vegetation. Elk thrive on revitalized spring green-up areas, creating more opportunities for hunting and wildlife watching.

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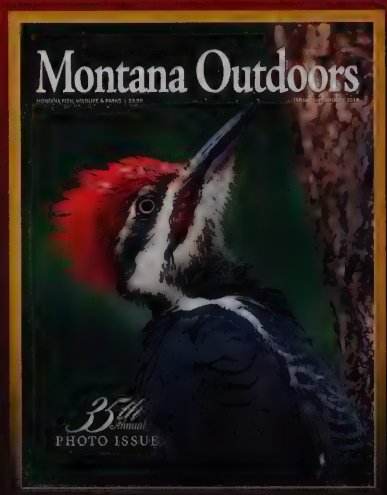

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avoid harming trout. Sieben crews use portable fence to keep cattle away from Cottonwood Creek, home to a restored native westslope cutthroat population. "The usual set 'em and forget 'em approach to grazing public land is often a huge problem for coldwater species," says Dave Moser, FWP fisheries biologist in Bozeman. "But well-managed grazing like at Beartooth can definitely be compatible with both cutthroat and bull trout restoration."

FWP officials acknowledge that conservation grazing isn't good for all wildlife. As cows improve habitat for some species, they can degrade living conditions for others. "With grazing, there are always winners and losers," says Northrup. "Cows definitely can muck up a stream crossing or mow down hiding cover, but on the whole we aim for a net gain to wildlife and conservation."

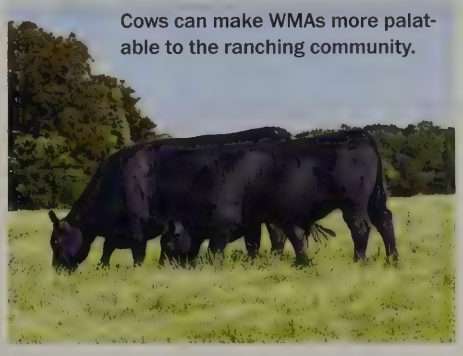
17 OF 70

FWP has used cows to improve wildlife habitat on WMAs for decades. Influenced by meetings with Hormay, the rotational grazing guru, the department in 1981 began its first lease at Mount Haggin, just outside Anaconda. Today, Mount Haggin

GOOD GRAZING MAKES GOOD NEIGHBORS

In addition to improving wildlife habitat and giving neighbors additional pasture, WMA grazing strengthens relations between FWP and Montana's stock growers, farmers, and rural communities. "I can't stress enough how important that is to the department's long-term effectiveness," says Ken McDonald, head of the FWP Wildlife Division.

WMA grazing and other FWP "working-lands conservation" projects have also helped maintain relations between the department and rural lawmakers. "Our successful WMA grazing programs were a factor in the Legislature passing the Habitat Montana and Upland Game Bird Enhancement bills," McDonald says. What's more, he adds, the Fish and Wildlife Commission has instructed FWP to make sure habitat programs "promote habitat-friendly agriculture."

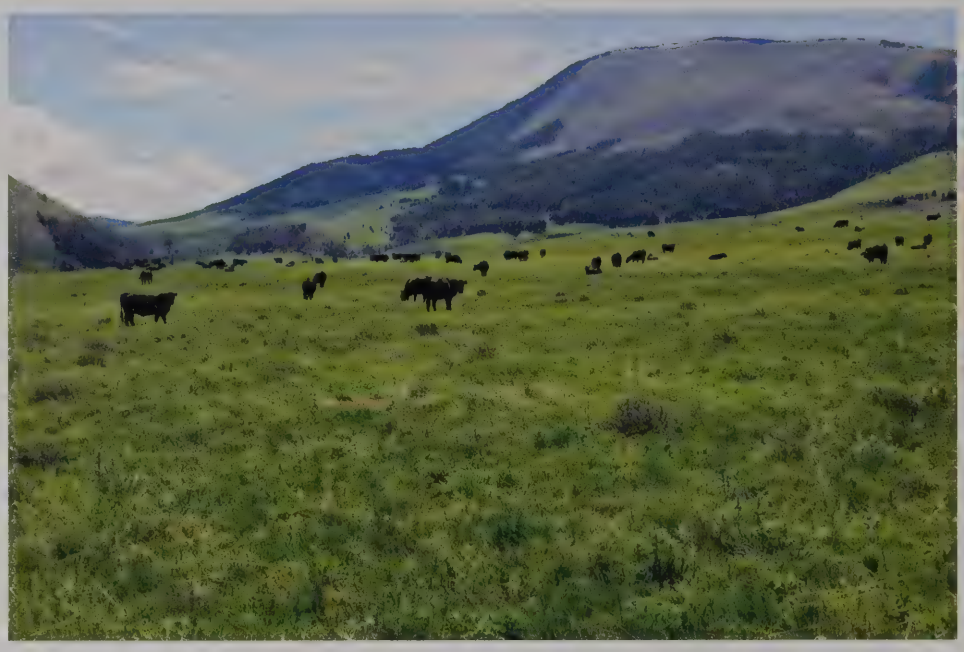


Cows can make WMAs more palatable to the ranching community.

Grazing also makes it easier for FWP to acquire new WMAs or expand existing areas. Some Montanans object to FWP buying land, even though acquisitions come from willing sellers. But when neighbors see cowboys herding cattle on WMAs, they may view FWP ownership in a new light. "A lot of people like to see public land provide some additional economic use," McDonald says.

Grazing leases have also allowed FWP biologists to develop relationships and build trust with neighbors, leading to better wildlife conservation practices on private land. WMAs demonstrate sustainable grazing practices that landowners can apply to their own property. Grazing on WMAs also increases neighboring ranchers' tolerance for having elk on their property. "Farmers and ranchers own millions of acres of wildlife habitat across Montana," McDonald says. "It makes sense for us to partner with them whenever possible." ■

LEFT TO RIGHT: CHRIS MCGOWAN; KENTON ROWE; KEN ARCHER; JACK BALLARD; THOM BRIDGE; SHUTTERSTOCK



CONTENTED COWS Cattle on the Matador Ranch (left) and the Sieben Adel Ranch (with Chase Hibbard, above) thrive on pasture managed for rotational grazing. "How we manage our cows ultimately gets down to caring for the soil to make sure this land stays healthy and productive for future generations," Hibbard says.

and Beartooth are among just a handful of WMAs—roughly 17 of 70—where FWP allows cattle. "We put cows on our property only if we're sure they will benefit specific species," says Johnson.

FWP plant ecologist Bob Harrington tracks long-term effects of grazing on WMAs, monitoring vegetation growth, species composition, and soil health. "This allows us to assess grazing impacts over time," Harrington says. FWP uses the information to adjust grazing leases in ways that increase benefits and reduce problems.

> "You can misuse any tool, or you can use it correctly."

Improvements don't happen overnight. On southwestern Montana's Robb-Ledford WMA, it took two decades of installing fencing and making grazing adjustments before streams recovered from past overuse. Biologists and ranchers experimented for years on Madison-Wall Creek WMA, in the upper Madison River valley, to develop a grazing regime that best serves the wildlife area's 700 elk and the 1,200 cows on neighboring ranches.

Not surprising for such a counterintuitive practice, WMA grazing has its critics. "We're skeptical that FWP is achieving the wildlife benefits it claims that grazing produces on WMAs," says Glenn Hockett, president of the Gallatin Wildlife Association. "We'd like to see a study proving that even rotational grazing is better there than no grazing at all."

While acknowledging concerns about grazing on wildlife areas, Northrup says FWP provides a reasonable, science-based middle ground. "There's a wide range of opinions out there, from those who see no problems with grazing public land to those who want it entirely off public land," he says. "On WMAs, we're showing that grazing under carefully managed conditions can be good for both wildlife and cows."

A ONE-TON TOOL

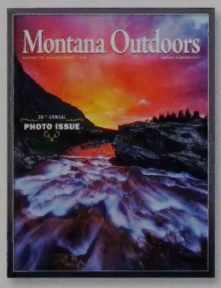
After talking to Loecker, I head to the Sieben Livestock Company's Adel Ranch to meet Chase Hibbard and his nephew Cooper Hibbard. Beartooth WMA sits high above us, overlooking the ranch's 16,500 acres of pasture where the family has used rotational grazing since 1992. "Within a year we saw tangible improvements in grass vigor, then density, then diversity," Chase says. "Since then, we've grown way more of the desirable, nutritious plants that cows like best, like bluebunch wheatgrass."

Cooper, ranch manager, explains that Sieben Livestock uses a three-pasture rotation method. In a given year, one 3,000- to 7,000-acre pasture is grazed during the growing season, one is grazed only after grass seed heads ripen in early July, and one is rested with no grazing. That regime, the same that FWP requires in its grazing leases, gives each pasture two full years of not being grazed before seeds ripen. "Our cattle benefit from the same things that benefit wildlife up on the Beartooth: healthy, functioning soil and vegetation, and healthy, functioning watersheds," Cooper says.

It's tough for many people to grasp the concept of cows as ecosystem enhancers. They picture healthy prairie as a sea of knee-high grasses rippling in the breeze. And it's true that in much of the semiarid West, improperly managed cows trample streams and turn range into moonscapes.

Yet by eating grass and drinking water, cows today do nothing different from what millions of grazing bison did for thousands of years. What's the difference?

Movement, says Martin, the TNC habitat expert. Kept on the go by predators and human hunters, bison naturally mowed down some grassland areas while leaving others to regenerate. With managed movement, cows can produce similar effects. Martin says cattle—whether on a private ranch or a state wildlife area—are a tool for managing grasslands: "You can misuse any tool, or you can use it correctly."



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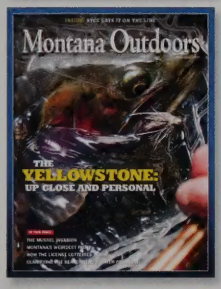

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Counting Ghosts In the deep of winter, far into the backcountry, wildlife biologists search for the West's most elusive carnivore. By Hal Herring. Photos by Tony Bynum

Continental Continuum Searching for the origins of the Old North Trail along the Rocky Mountain Front. By David Cronenwett

From Abstraction to Reality At FWP's Montana WILD education facility, kids and adults discover, appreciate, and take pride in the natural surroundings where they live. By Tom Dickson. Photos by Thom Bridge

Great Gravel New research shows how underground floodplains maintain healthy river "immune systems." By Jim Robbins

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In the Driveway Following a mountain lion from my house to the forest. By Bruce Smith

Doing Just Fine We have heaters, parkas, and freezers full of food. Wildlife have found their own ways to survive winter. Photo Essay

Green Grazing Why The Nature Conservancy and Montana Fish, Wildlife & Parks are using cows to improve wildlife habitat. By Tom Dickson

BACK ISSUES

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It's busy out there

by Bruce Auchly

When temperatures drop far below zero, we often think of the outside as a dead zone.

Plants and mammals are asleep. Birds have flown south. Generally we equate winter's long nights and cold temperatures with death.

Here's a wake-up call: Nature in winter is alive. Whether in the woods, on the prairie, or right in town, life is teeming even when we don't see it.

Let's start where it's obvious. The bird feeder in your yard is buzzing with house sparrows and finches, eating birdseed and surviving.

Meanwhile, lurking in the bushes nearby might be a sharp-shinned hawk, looking to snare a careless songbird.

Depending on where you live, gray squirrels, fox squirrels, and cottontail rabbits scurry about trying to avoid the neighbor's house cat. And if it's night, the rabbits and cats are both in the sights of a great horned owl.

Which brings us to love in the cold.

In January and February, great horned owls will be breeding. All that hooting you hear at night isn't just local owls harmonizing for fun. They're looking for mates.

After mating, the owls continue their aggressive hooting, not to proclaim their love and affection but to stake out a nesting territory and warn other owls away. If you hear two owls hooting together in winter, the deeper voice is the male's (even though the female is larger).

The bald eagle is another winter romantic. By the end of February, many Montana bald eagles are sitting on eggs. (Golden eagles mate and nest later, in early spring.)

Why would bald eagles and great horned owls mate and lay eggs now? Because it takes so long to raise their young. They need to reproduce now so they can teach their young to hunt in the summer when prey is abundant and easier to catch.

While love is in the treetops, animals on the prairie, under that blanket of snow, are focused mostly on simple survival. Various rodent species scurry about looking for seeds to eat, while a least weasel seeking mouse meat might be close behind.

With their incredible hearing, coyotes sit atop the snow and listen for meadow voles running below. A coyote's hearing is so acute it can pounce on and capture a rodent underneath the snow without ever seeing its prey.

Cruising just above the prairie might be a rough-legged hawk, a winter resident that migrates south to "balmy" Montana from the Arctic, looking for the same rodents it eats back home. It's tough to be a vole.

Insects are mostly dead or asleep in their larval stage, but honeybees are very much alive and awake, clustered in a man-made hive or an old tree.

There's another insect active in the winter woods. On a mild, sunny winter day, check next to trees for snow that looks like someone spilled black pepper on it.

Closer inspection will reveal tiny insects jumping about. Those are snow fleas, also known as springtails. The minute insects live under leaves and on tree bark and perform their civic duty by eating organic debris on the forest floor. Unable to control the direction of their jumping, on warm winter days springtails often end up in the snow.

And you thought nothing was going on outside today.

Bruce Auchly manages the FWP Regional Information and Education Program in Great Falls. Ed Jenne is a Missoula illustrator.

ILLUSTRATION BY E.R. JENNE

Great gray owl

Strix nebulosa **By Mike Roberts**

As daybreak gradually unveiled the clearing, a single rifle shot echoed from a distant mountain. Some lucky person's hunt had ended in the first minutes of the season. Having experienced such good fortune myself in previous seasons, I smiled. Soon afterward, another rifle cracked off to the south, but was followed by a volley of three quick rounds. I knew that feeling, too. But I wasn't there that day to notch my nonresident big-game license. I was after owls.

For hours, I meticulously glassed the long, narrow meadow from just inside the tree line. Finally, less than 40 yards away, a large, spectral shadow floated from the forest edge and dropped silently into the sallow-colored bunchgrass. With a meadow vole secured in its bill, the owl flew to a lodgepole snag. After swallowing the morsel, the great gray swiveled its head toward me, its bright yellow eyes meeting mine.

As a naturalist and wildlife photographer, locating and capturing images of these human-tolerant raptors is my top priority, greater even than taking a bull elk during my annual fall pilgrimage to Montana.

Identification

The great gray, sometimes called "phantom of the North," is North America's largest owl, at least in stature (26 to 28 inches) and wingspan (four and a half feet). Though slightly shorter, the great horned owl weighs a bit more than the great gray's two pounds.

Often observed hunting during the day, the great gray owl's cryptic coloration is mostly a dusky gray, with contrasting dark gray bars on the back, and heavily streaked underparts.

Other distinguishing features include a lack of ear tufts and oversized facial disks with charcoal-gray, radial lines arranged concentrically to the close-set yellow eyes. The black chin is highlighted by a white "bow tie" of feathers.

Mating great gray owls make territorial calls back and forth at night in late winter and early spring, a soft *whoo-whoo-whoo* every 15 to 30 seconds.

Range

Montana is one of only a few states in the Lower 48 where great grays reside. The grand owl also lives in Alaska, Canada, throughout northern Asia, and in northern Europe, where it is known as the Lapland owl.

In Montana, this uncommon year-round resident lives mainly west of the Continental Divide in pine, spruce, and fir forests laced with swamps, wet meadows, and parks. The raptor hunts in these open areas from perches in mature conifers or tall snags.

Prey and hunting

Great gray owls eat small mammals, including voles, mice, pocket gophers, and snowshoe hares.

They can find their prey beneath two feet of snow thanks to facial disks that funnel sound waves to slightly asymmetrically positioned ear openings—one just slightly higher than the other. This physical adaptation produces three-dimensional hearing for pinpointing faint noises produced by small rodents using hidden travel corridors. With billowy body feathers and serrated primaries designed to muffle flight noise, these silent hunters descend from their perch and plunge talons first into the snow, emerging moments later with their prey.

Scientific name

Strix is derived from the Greek *strizo*, meaning "to screech." Derived from the Latin *nebulosos*, meaning "misty" or "cloudy," ***nebulosa*** refers to the birds clouded plumage.

Reproduction

Great gray owls nest in Montana from April through July, using abandoned hawk nests and tree snags. The female incubates two to four white eggs for approximately one month. She broods the owlets until their natal down molts and is replaced with protective feathers. During incubation and brooding, the male supplies food to his preoccupied mate. Within three weeks, the flightless juveniles vacate the nest and begin exploring nearby trees. The rambunctious young owls occasionally fall, making them susceptible to ground-dwelling predators.

Conservation status

Symbolic of all things wild, Montana's great gray owls seem to adapt reasonably well to ever-increasing human populations, though some collide with vehicles or are illegally shot. Populations appear healthy within their range across North America. In Montana the great gray owl is considered a species of concern because so little is known about its habitat needs and population status.

Virginia photographer and writer Mike Roberts regularly visits Montana.

ZACK CLOTHIER

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PARTING SHOT

GRAZING RIGHT Cows take a feeding break as the sun sets on the Matador Ranch in southern Phillips County. See page 30 to learn how cattle are being used to improve wildlife habitat on property owned by The Nature Conservancy and Montana Fish, Wildlife & Parks. Photo by Ami Vitale.

Montana Fish, Wildlife & Parks

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